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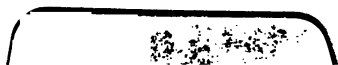


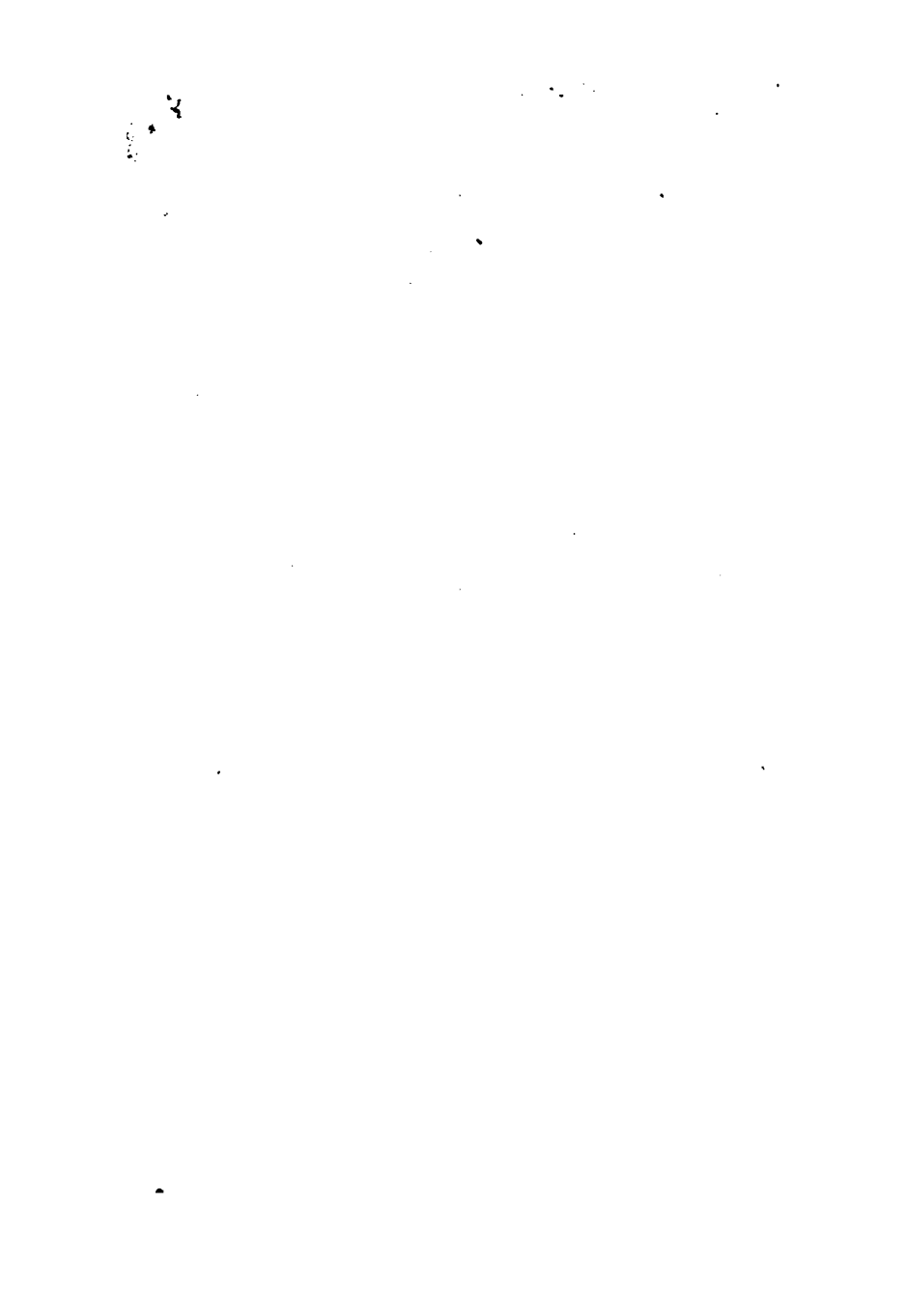
KEY TO
MANUAL
OF
SHORT METHODS IN ARITHMETIC
—
HUNTER



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1802 f. 5^x





K E Y
TO
HUNTER'S MANUAL
OF
SHORT METHODS IN ARITHMETIC

CONTAINING SOLUTIONS OF ALL THE UNWORKED
EXAMPLES IN THAT TREATISE

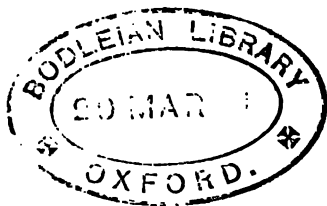
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KEY

TO

HUNTER'S MANUAL

OF

SHORT METHODS IN ARITHMETIC.



Exercises 1.

1.	4371	17391	3	2.	2668	8188	3
		13113				8004	
	2)4278	4371	2		184	2668	14
		2139				184	
	<i>Ans.</i> 93	2139	23			828	
		186				736	
		279			<i>Ans.</i> 92	184	2

3.	73033	118007	1	4.	29735	39330	1
	2)44974	73033	3		9595	29735	
		22487				28785	
	4)5572	22487	16		2)950	9595	20
		1393				9500	
		8557			<i>Ans.</i> 95	475	5
		8358					
	<i>Ans.</i> 199	1393	7				

4 KEY TO SHORT METHODS IN ARITHMETIC.

5.	58345	57670	1	6.	78329	137897	1
	9)3285	54385	149		12)59568	78329	
	<i>Ans.</i> 365	365			4)4964	7446	
		1788			1241	3869	
		1460				3723	
		3285			2)146	1241	17
					<i>Ans.</i> 73	73	
						511	

7.	2)56498	67691	2		2)30094		
	28249	56498			533	15047	28
	3)11193	28249	7			1066	
	3731	26117				4387	
	4)2132	3731	7			4264	
	<i>g.c.m.</i> 533	3731			3)123	533	13
					<i>Ans.</i> 41	533	

8.	5)266815				731	42527	58
	22661	53363	2			3655	
		45322				5977	
	8041	22661	2			5848	
		16082			3)129	731	17
	9)6579	8041	11		<i>Ans.</i> 43	43	
	<i>g.c.m.</i> 731	8041				301	

9.	348467	425383	1		469	228269	486
	4)76916	348467	18			1876	
	19229	19229				4066	
		156177				3752	
		153832				3149	
	5)2345	19229	41			2814	
	<i>g.c.m.</i> 469	1876			5)335	469	7
		469			<i>Ans.</i> 67	469	

Exercises 2.

- 693 = $3 \times 3 \times 7 \times 11$; cancelling 11 gives $\frac{63}{11}$.—*Ans.*
- 276 = 12×23 ; cancelling 23 gives $\frac{12}{23}$.—*Ans.*
- 925 = $5 \times 5 \times 37$; cancelling 37 gives $\frac{19}{37}$.—*Ans.*
- 3311 = $11 \times 7 \times 43$; cancelling 43 gives $\frac{11}{43}$.—*Ans.*
- 2765 = $5 \times 7 \times 79$; cancelling 79 gives $\frac{35}{79}$.—*Ans.*

6. $2538 = 6 \times 9 \times 47$; cancelling 47 gives $\frac{54}{9}$.—*Ans.*

7. $4746 = 6 \times 7 \times 113$; cancelling 113 gives $\frac{31}{42}$.—*Ans.*

8. Cancelling 3 gives $\frac{868}{4681}$; then, $868 = 4 \times 7 \times 31$; cancelling 31 gives $\frac{28}{151}$.—*Ans.*

$$\begin{array}{r|l} 9. & 323 \quad \begin{array}{|l} 1349 \\ 1292 \\ \hline 323 \\ 19 \\ \hline 133 \end{array} & 4 \\ & 3)57 & 17 \\ \text{G.C.M. 19} & & \\ \text{Ans. } \frac{17}{71}. & & \end{array}$$

$$\begin{array}{r|l} 10. & 4171 \quad \begin{array}{|l} 6499 \\ 4171 \\ \hline 291 \\ 1261 \\ 1164 \\ \hline 291 \end{array} & 1 \\ & 8)2328 & 14 \\ & 291 & \\ \text{G.C.M. 97} & & 3 \\ \text{Ans. } \frac{43}{87}. & & \end{array}$$

$$\begin{array}{r|l} 11. & 3287 \quad \begin{array}{|l} 6631 \\ 3287 \\ \hline 19 \\ 138 \\ 133 \\ \hline 57 \end{array} & 1 \\ & 11)3344 & 173 \\ & 8)304 & \\ & 2)38 & \\ \text{G.C.M. 19} & & \\ \text{Ans. } \frac{173}{345}. & & \end{array}$$

$$\begin{array}{r|l} 12. & 2461 \quad \begin{array}{|l} 13589 \\ 12305 \\ \hline 2461 \\ 214 \\ \hline 321 \end{array} & 5 \\ & 12)1284 & 23 \\ \text{G.C.M. 107} & & \\ \text{Ans. } \frac{23}{127}. & & \end{array}$$

Exercises 3.

$$\begin{array}{r} 1. \quad 7s. \quad 3\frac{3}{4}d. \\ \quad \quad 12 \\ \hline 2)87 \quad 9 \\ \quad 43 \quad 10\frac{1}{2} \\ \hline 131 \quad 7\frac{1}{2} \\ \hline \text{£6 11s. } 7\frac{1}{2}d. \text{ Ans.} \end{array}$$

$$\begin{array}{r} 2. \quad 78s. \quad 11\frac{1}{4}d. \\ \quad \quad 12 \\ \hline 2)947 \quad 3 \\ \quad 473 \quad 7\frac{1}{2} \\ \hline 1499 \quad 9\frac{3}{4} \\ \hline \text{£74 19s. } 9\frac{3}{4}d. \text{ Ans.} \end{array}$$

$$\begin{array}{r} 3. \quad 119s. \quad 10\frac{1}{4}d. \\ \quad \quad 12 \\ \hline 4)1438 \quad 6 \\ \quad 359 \quad 7\frac{1}{2} \\ \hline 1798 \quad 1\frac{1}{2} \\ \hline \text{£89 18s. } 1\frac{1}{2}d. \text{ Ans.} \end{array}$$

$$\begin{array}{r} 4. \quad 17s. \quad 8\frac{1}{4}d. \\ \quad \quad 12 \\ \hline 3)212 \quad 3 \\ \quad 70 \quad 9 \\ \hline 300 \quad 8\frac{1}{4} \\ \hline \text{£15 0s. } 8\frac{1}{4}d. \text{ Ans.} \end{array}$$

$$\begin{array}{l} 5. \quad 6s. \quad 5d. \times 20 \\ = £6 + 1s. \quad 8d. \times 5 \\ = £6 \quad 8s. \quad 4d. \text{ Ans.} \end{array}$$

$$\begin{array}{l} 6. \quad 13s. \quad 6\frac{1}{2}d. \\ \quad \quad 12 \\ \hline 162\frac{1}{2}s. \\ = £8 \quad 2s. \quad 6d. \text{ Ans.} \end{array}$$

$$\begin{array}{r}
 7. \quad 16s. \ 5d. \\
 \quad \quad 12 \\
 \hline
 \quad 1973 \ 0 \\
 \quad 2137 \ 5 \\
 \hline
 \pounds 106 \ 17s. \ 5d. \ Ans.
 \end{array}$$

$$\begin{array}{r}
 8. \quad 16s. \ 10\frac{1}{2}d. \\
 \quad \quad 12 \\
 \hline
 2)202 \ 6 \\
 2)101 \ 3 \\
 \hline
 \quad 50 \ 7\frac{1}{2} \\
 \quad 354 \ 4\frac{1}{2} \\
 \hline
 \pounds 17 \ 14s. \ 4\frac{1}{2}d. \ Ans.
 \end{array}$$

$$\begin{array}{r}
 9. \quad 30s. \ 8\frac{1}{2}d. \\
 \quad \quad 12 \\
 \hline
 \quad 368 \ 3 \\
 \hline
 \pounds 18 \ 8s. \ 3d. \ Ans.
 \end{array}$$

$$\begin{array}{r}
 10. \quad 17s. \ 9\frac{1}{2}d. \\
 \quad \quad 12 \\
 \hline
 \quad 213 \ 6 \\
 \quad 231 \ 3\frac{1}{2} \\
 \hline
 \pounds 11 \ 11s. \ 3\frac{1}{2}d. \ Ans.
 \end{array}$$

$$\begin{array}{r}
 11. \quad 15s. \ 7\frac{3}{4}d. \\
 \quad \quad 12 \\
 \hline
 \quad 187 \ 9 \\
 \hline
 \pounds 9 \ 7s. \ 9d. \ Ans.
 \end{array}$$

$$\begin{array}{r}
 12. \quad 51s. \ 9\frac{3}{4}d. \\
 \quad \quad 12 \\
 \hline
 2)621 \ 9 \\
 2)310 \ 10\frac{1}{2} \\
 \hline
 \quad 155 \ 5\frac{1}{2} \\
 \quad 1088 \ 0\frac{3}{4} \\
 \hline
 \pounds 54 \ 8s. \ 0\frac{3}{4}d. \ Ans.
 \end{array}$$

$$\begin{array}{r}
 13. \quad 30s. \ 6d. \\
 \quad \quad 20 \\
 \hline
 \pounds 30\frac{1}{2} \\
 \text{or } \pounds 30 \ 10s. \ Ans.
 \end{array}$$

$$\begin{array}{r}
 14. \quad 189s. \ 10d. \\
 \quad \quad 12 \\
 \hline
 \quad 2278 \ 0 \\
 \hline
 \pounds 113 \ 18s. \ Ans.
 \end{array}$$

$$\begin{array}{r}
 15. \quad 133s. \ 11\frac{1}{2}d. \\
 \quad \quad 12 \\
 \hline
 \quad 1607 \ 6 \\
 \quad 1741 \ 5\frac{1}{2} \\
 \hline
 \pounds 87 \ 1s. \ 5\frac{1}{2}d. \ Ar
 \end{array}$$

$$16 \quad 14\frac{3}{4}s. \times 20 = \pounds 14\frac{3}{4} = \pounds 14 \ 15s. \ Ans.$$

$$\begin{array}{r}
 17. \quad 6s. \ 11d. \\
 \quad \quad 12 \\
 \hline
 4)83 \ 0 \\
 \quad 20 \ 9 \\
 \hline
 \quad 103 \ 9 \\
 \hline
 \pounds 5 \ 3s. \ 9d. \ Ans.
 \end{array}$$

$$\begin{array}{r}
 18. \quad 14s. \ 5\frac{1}{4}d. \\
 \quad \quad 12 \\
 \hline
 2)173 \ 3 \\
 \quad 86 \ 7\frac{1}{2} \\
 \hline
 \quad 274 \ 3\frac{3}{4} \\
 \hline
 \pounds 13 \ 14s. \ 3\frac{3}{4}d. \ Ans.
 \end{array}$$

19. $67s. 3\frac{3}{4}d.$

$$\begin{array}{r} 12 \\ 2)807 \ 9 \\ \underline{403} \ 10\frac{1}{2} \\ 1211 \ 7\frac{1}{2} \end{array}$$

£60 11s. $7\frac{1}{2}d.$ Ans.

20. $12s. 11\frac{1}{2}d. \times 10$

$$\begin{array}{r} 12 \\ 1295 \ 6 \\ \underline{129} \ 7 \\ 285 \ 1 \end{array}$$

£14 5s. 1d. Ans.

21. $36s. 1\frac{1}{4}d. \times 11$

$$\begin{array}{r} 12 \\ 433 \ 3 \\ \underline{397} \ 1\frac{3}{4} \\ 830 \ 4\frac{3}{4} \end{array}$$

£41 10s. $4\frac{3}{4}d.$ Ans.

22. $97s. 6d.$

$$\begin{array}{r} 12 \\ 2)1170 \ 0 \\ 585 \ 0 \\ \underline{292} \ 6 \\ 2047 \ 6 \end{array}$$

£102 7s. 6d. Ans.

Exercises 4.

1. 260 at 15s. 2d.

$$\begin{array}{r|l} 240 & £182 \\ 20 = \frac{1}{5} & 15 \ 3 \ 4 \\ \hline \text{Ans.} & £197 \ 3 \ 4 \end{array}$$

2. 264 at 9s. $1\frac{1}{2}d.$

$$\begin{array}{r|l} 240 & £109 \ 10 \ 0 \\ 24 = \frac{1}{10} & 10 \ 19 \ 0 \\ \hline \text{Ans.} & £120 \ 9 \ 0 \end{array}$$

3. 320 at 4s. $11\frac{1}{2}d.$

$$\begin{array}{r|l} 240 & £59 \ 5 \ 0 \\ 80 = \frac{1}{3} & 19 \ 15 \ 0 \\ \hline \text{Ans.} & £79 \ 0 \ 0 \end{array}$$

4. 247 at 13s. 7d.

$$\begin{array}{r|l} 240 & £163 \ 0 \ 0 \\ 7 & 4 \ 15 \ 1 \\ \hline \text{Ans.} & £167 \ 15 \ 1 \end{array}$$

5. 344 at 16s. $3\frac{1}{4}d.$

$$\begin{array}{r|l} 240 & £195 \ 5 \ 0 \\ 80 = \frac{1}{3} & 65 \ 1 \ 8 \\ 24 = \frac{1}{10} & 19 \ 10 \ 6 \\ \hline \text{Ans.} & £279 \ 17 \ 2 \end{array}$$

6. 340 at 28s. 5d.

$$\begin{array}{r|l} 240 & £341 \ 0 \ 0 \\ 80 = \frac{1}{3} & 113 \ 13 \ 4 \\ 20 = \frac{1}{6} & 28 \ 8 \ 4 \\ \hline \text{Ans.} & £483 \ 1 \ 8 \end{array}$$

7. 136 at 29s. 8d.

$$\begin{array}{r|l} 240 & £356 \\ 120 = \frac{1}{2} & 178 \ 0 \ 0 \\ 12 = \frac{1}{10} & 17 \ 16 \ 0 \\ 4 = \frac{1}{5} & 5 \ 18 \ 8 \\ \hline \text{Ans.} & £201 \ 14 \ 8 \end{array}$$

Otherwise, by Practice.

$$\begin{array}{r|l} s. \ d. & £136 \ 0 \ 0 \\ 5 \ 0 = \frac{1}{4} & 34 \ 0 \ 0 \\ 4 \ 0 = \frac{1}{5} & 27 \ 4 \ 0 \\ 0 \ 8 = \frac{1}{6} & 4 \ 10 \ 8 \\ \hline & £201 \ 14 \ 8 \end{array}$$

8. 368 at 10s. 8½d.

240	£128	10	0
80 = $\frac{1}{3}$	42	16	8
48 = $\frac{1}{2}$	25	14	0
<i>Ans.</i> £197 0 8			

9. 197 at 54s. 10d.

240	£658		
120 = $\frac{1}{2}$	329	0	0
60 = $\frac{1}{3}$	164	10	0
12 = $\frac{1}{4}$	32	18	0
5 = $\frac{1}{12}$	13	14	2
<i>Ans.</i> £540 2 2			

10. 294 at 17s. 8d.

240	£212	0	0
24 = $\frac{1}{10}$	21	4	0
30 = $\frac{1}{8}$	26	10	0
<i>Ans.</i> £259 14 0			

11. 271 at 5s. 3½d.

240	£63	5	0
30 = $\frac{1}{2}$	7	18	1½
1	0	5	3½
<i>Ans.</i> £71 8 4½			

12. 119 at 13s. 11d.

240	£167	0	0
120 = $\frac{1}{2}$	83	10	0
-1	-0	13	11
<i>Ans.</i> £82 16 1			

13. 287 at 18s. 10d.

240	£226	0	0
48 = $\frac{1}{5}$	45	4	0
	271	4	0
-1	-0	18	10
<i>Ans.</i> £270 5 2			

14. 93 at 77s. 10½d.

240	£934	10	0
80 = $\frac{1}{3}$	311	10	0
12 = $\frac{1}{20}$	46	14	6
1	3	17	10½
<i>Ans.</i> £362 2 4½			

15. 291 at 29s. 7½d.

240	£355	10	0
40 = $\frac{1}{3}$	59	5	0
10 = $\frac{1}{4}$	14	16	3
1	1	9	7½
<i>Ans.</i> £431 0 10½			

16. 366 at 113s.

240	£1356	0	0
120 = $\frac{1}{2}$	678	0	0
6 = $\frac{1}{20}$	33	18	0
<i>Ans.</i> £2067 18 0			

17. 184 at 19s. 5d.

240	£233		
80 = $\frac{1}{3}$	77	13	4
80 = $\frac{1}{3}$	77	13	4
24 = $\frac{1}{10}$	23	6	0
<i>Ans.</i> £178 12 8			

18. 79 at 4s. 9¾d.

240	£57	15	0
80 = $\frac{1}{3}$	19	5	0
-1	-0	4	9¾
<i>Ans.</i> £19 0 2¼			

19. 89 at 5s. 1¾d.

240	£61	15	0
48 = $\frac{1}{5}$	12	7	0
40 = $\frac{1}{3}$	10	5	10
1	0	5	1¾
<i>Ans.</i> £22 17 11¾			

20. 375 at 12s. 7½d.

240	£151 15 0
120 = ½	75 17 6
15 = ⅙	9 9 8½
Ans. £237 2 2½	

21. 372 at 7s. 9d.

240	£93 0 0
120 = ½	46 10 0
12 = ⅒	4 13 0
Ans. £144 3 0	

22. 127 at 73s. 2d.

240	£878
120 = ½	439 0 0
6 = ⅙	21 19 0
1	3 13 2
Ans. £164 12 2	

23. 348 at 6s. 9½d.

240	£81 15 0
60 = ¼	20 8 9
48 = ⅔	16 7 0
Ans. £118 10 9	

24. 411 at 66s. 5d.

240	£797 0 0
80 = ⅓	265 13 4
80 = ⅓	265 13 4
10 = ⅓	33 4 2
1	3 6 5
Ans. £1364 17 3	

25. 265 at 11s. 2½d.

240	£134 5 0
20 = ⅓	11 3 9
5 = ⅕	2 15 11½
Ans. £148 4 8½	

26. 113 at 32s. 7d.

240	£391
80 = ⅓	130 6 8
30 = ⅓	48 17 6
3 = ⅒	4 17 9
Ans. £184 1 11	

27. 452 at 19s. 3½d.

240	£231 10 0
120 = ½	115 15 0
80 = ⅓	77 3 4
12 = ⅒	11 11 6
Ans. £435 19 10	

28. 365 at 4s. 9½d.

240	£57 10 0
80 = ⅓	19 3 4
30 = ⅓	7 3 9
15 = ⅓	3 11 10½
Ans. £87 8 11½	

29. 855 at 86s. 4½d.

240	£1036 10 0
720	3109 10 0
120 = ⅓	518 5 0
15 = ⅓	64 15 7½
3692 10 7½	

30. 299 at 11s. 9½d.

240	£141 15 0
60 = ¼	35 8 9
	177 3 9
-1	- 0 11 9½
Ans. £176 11 11½	

31. 547 at 12s. 11½d.

240	£155 15 0
240	155 15 0
60 = ¼	38 18 9
6 = ⅒	3 17 10½
1	0 12 11½
Ans. £354 19 7½	

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32. 351 at 97s. 7d.

240	£1171 0 0
80 = $\frac{1}{3}$	390 6 8
30 = $\frac{1}{6}$	146 7 6
1	4 17 7

Ans. £1712 11 9

33. 390 at 36s. 10½d.

240	£442 5 0
120 = $\frac{1}{2}$	221 2 6
30 = $\frac{1}{4}$	55 5 7½

Ans. £718 13 1½

34. 558 at 65s. 8d.

240	£788 0 0
240	788 0 0
48 = $\frac{1}{5}$	157 12 0
30 = $\frac{1}{6}$	98 10 0

Ans. £1832 2 0

35. 503 at 21s. 8½d.

240	£260 10 0
240	260 10 0
24 = $\frac{1}{10}$	26 1 0
	547 1 0
-1	- 1 1 8½

Ans. 545 19 3½

36. 615 at 53s. 6d.

240	£642 0 0
240	642 0 0
120 = $\frac{1}{2}$	321 0 0
15 = $\frac{1}{8}$	40 2 6

Ans. £1645 2 6

37. 365 at 15s. 8½d.

240	£188 5 0
80 = $\frac{1}{3}$	62 15 0
30 = $\frac{1}{6}$	23 10 7½
15 = $\frac{1}{4}$	11 15 3¾

Ans. £286 5 11¼

38. 139 at 36s. 2½d.

240	£434 10 0
120 = $\frac{1}{3}$	217 5 0
20 = $\frac{1}{6}$	36 4 2
	253 9 2
-1	- 1 16 2½

Ans. £251 12 11¼

39. 857 at 51s. 4d.

240	£616
720	1848 0 0
48 = $\frac{1}{5}$	123 4 0
48 = $\frac{1}{6}$	123 4 0
40 = $\frac{1}{6}$	102 13 4
1	2 11 4

Ans. £2199 12 8

40. 169 at 34s. 3d.

240	£411
120 = $\frac{1}{2}$	205 10 0
48 = $\frac{1}{5}$	82 4 0
1	1 14 3

Ans. £289 8 3

Exercises 5.

1. 210 at $14\frac{7}{8}d.$

$$\begin{array}{r|rrr} 240 & £14 & 17 & 6 \\ 120 = \frac{1}{2} & 7 & 8 & 9 \\ 60 = \frac{1}{4} & 3 & 14 & 4\frac{1}{2} \\ 30 = \frac{1}{8} & 1 & 17 & 2\frac{1}{4} \\ \hline \text{Ans.} & £13 & 0 & 3\frac{3}{4} \end{array}$$
2. $9\frac{7}{12}$ at $9s. 7\frac{1}{2}d.$

$$\begin{array}{r|rrr} & £4 & 6 & 7\frac{1}{2} \\ & 4 & 9\frac{3}{4} & \\ & 0 & 9 & \frac{1}{2} \\ \hline \text{Ans.} & £4 & 12 & 2\frac{3}{4} \end{array}$$
3. 317 at $6d. = 158s. 6d. = £7 18s. 6d.$
 at $3d. = 79 3$
 at $\frac{1}{8}$ of $3d. = 0 9 11$

$$\text{Ans. } £8 \quad 8 \quad 5$$
4. $133\frac{1}{2}$ at $7\frac{1}{2}d.$

$$\begin{array}{r|rrr} 240 & £7 & 5 & 0 \\ 120 = \frac{1}{2} & 3 & 12 & 6 \\ 12 = \frac{1}{10} & 0 & 7 & 3 \\ 1\frac{1}{2} = \frac{1}{8} & 0 & 0 & 11 \\ \hline \text{Ans.} & £4 & 0 & 8 \end{array}$$
5. $131\frac{1}{4}$ at $9\frac{1}{12}d.$

$$\begin{array}{r|rrr} 240 & £9 & 1 & 8 \\ 120 = \frac{1}{2} & 4 & 10 & 10 \\ 10 = \frac{1}{12} & 0 & 7 & 6\frac{2}{3} \\ 1\frac{1}{4} = \frac{1}{8} & 0 & 0 & 11\frac{1}{4} \\ \hline \text{Ans.} & £4 & 19 & 4 \end{array}$$
6. 358 at $6d. = 179s. = £8 19s. 0d.$
 at $\frac{1}{4}d. = 89\frac{1}{2}d. = 0 7 5\frac{1}{2}$

$$\text{Ans. } £8 \quad 11 \quad 6\frac{1}{2}$$
7. 280 at $7\frac{1}{8}d.$

$$\begin{array}{r|rrr} 240 & £7 & 2 & 6 \\ 40 = \frac{1}{8} & 1 & 3 & 9 \\ \hline \text{Ans.} & £8 & 6 & 3 \end{array}$$
8. 55 at $42\frac{3}{4}d.$

$$\begin{array}{r|rrr} 240 & £42 & 15 & 0 \\ 60 = \frac{1}{4} & 10 & 13 & 9 \\ -5 = \frac{1}{12} & 0 & 17 & 9\frac{3}{4} \\ \hline \text{Ans.} & £9 & 15 & 11\frac{1}{4} \end{array}$$
9. $276\frac{1}{4}$ at $5\frac{5}{8}d.$
 at $5d. = 1381\frac{1}{4}d. = 115s. 1\frac{1}{4}d.$
 at $\frac{1}{8}$ of $5d. = 14 4\frac{3}{4}$

$$\text{Ans. } £6 \quad 9s. \quad 6d.$$
10. $156\frac{5}{8}$ at $2\frac{3}{4}d. = \frac{1}{4}$ of $1722\frac{7}{8}d. = 430\frac{3}{4}d.$

$$\text{Ans. } 35s. 10\frac{3}{4}d.$$

12 KEY TO SHORT METHODS IN ARITHMETIC.

$$\begin{array}{r}
 11. \quad 113\frac{3}{4} \text{ at } 16\frac{5}{8}d. \\
 \hline
 240 \quad \pounds 16 \quad 8 \quad 4 \\
 80 = \frac{1}{3} \quad \left| \begin{array}{l} 5 \quad 9 \quad 5\frac{1}{2} \\ 30 = \frac{1}{3} \quad \left| \begin{array}{l} 2 \quad 1 \quad 0\frac{1}{2} \\ 3\frac{1}{2} = \frac{1}{3} \quad \left| \begin{array}{l} 0 \quad 5 \quad 1\frac{1}{2} \end{array} \right. \end{array} \right. \\
 \hline
 \text{Ans. } \pounds 7 \quad 15 \quad 7\frac{1}{4}
 \end{array}$$

$$\begin{array}{r}
 12. \quad 8\frac{3}{8}d. \times 4 \times 7 \\
 = 33\frac{1}{2}d. \times 7 \\
 = 234\frac{1}{2}d. = 19s. 6\frac{1}{2}d. \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 13. \quad 4\frac{1}{2} \text{ at } 21\frac{11}{16}s. = 21s. 11d. \times 4\frac{1}{2} \\
 = \pounds 1 \quad 7s. 8d. + 7s. 4d. \\
 = \pounds 4 \quad 15s. \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 14. \quad 19\frac{1}{4} \text{ at } 14\frac{5}{8}d. \\
 \quad \quad \text{at } 9d. = 173\frac{1}{4}d. \\
 \quad \quad \text{at } 5d. = 96\frac{1}{4} \\
 \quad \quad \text{at } \frac{1}{8} \text{ of } 5d. = 12 \\
 \hline
 \quad \quad \quad 281\frac{1}{2}d. \\
 \text{Ans. } 23s. 5\frac{1}{2}d.
 \end{array}$$

$$\begin{array}{r}
 15. \quad 23\frac{7}{8} \text{ at } 43\frac{3}{4}d. \\
 \hline
 240 \quad \pounds 43 \quad 15 \quad 0 \\
 24 = \frac{1}{10} \quad \left| \begin{array}{l} 4 \quad 7 \quad 6 \\ -\frac{1}{8} \quad \left| \begin{array}{l} -0 \quad 0 \quad 5\frac{1}{2} \end{array} \right. \end{array} \right. \\
 \hline
 \text{Ans. } \pounds 4 \quad 7 \quad 0\frac{1}{2}
 \end{array}$$

$$\begin{array}{r}
 16. \quad 37\frac{1}{2} \text{ at } 31\frac{7}{12}d. \\
 \hline
 240 \quad \pounds 31 \quad 11 \quad 8 \\
 30 = \frac{1}{3} \quad \left| \begin{array}{l} 3 \quad 18 \quad 11\frac{1}{2} \\ 7\frac{1}{2} = \frac{1}{4} \quad \left| \begin{array}{l} 0 \quad 19 \quad 8\frac{3}{4} \end{array} \right. \end{array} \right. \\
 \hline
 \text{Ans. } \pounds 4 \quad 18 \quad 8\frac{1}{4}
 \end{array}$$

$$\begin{array}{r}
 17. \quad 29\frac{3}{4} \text{ at } 21\frac{1}{4}d. \\
 \hline
 240 \quad \pounds 21 \quad 5 \quad 0 \\
 30 = \frac{1}{8} \quad \left| \begin{array}{l} 2 \quad 13 \quad 1\frac{1}{2} \\ -\frac{1}{4} \quad \left| \begin{array}{l} -0 \quad 0 \quad 5\frac{1}{4} \end{array} \right. \end{array} \right. \\
 \hline
 \text{Ans. } \pounds 2 \quad 12 \quad 8\frac{1}{4}
 \end{array}$$

$$\begin{array}{r}
 18. \quad 37\frac{5}{8} \text{ at } 13\frac{3}{8}d. \\
 \quad \quad \text{at } 10d. = 376\frac{1}{4}d. \\
 \quad \quad \text{at } 3d. = 112\frac{3}{4} \\
 \quad \quad \text{at } \frac{1}{8} \text{ of } 3d. = 14 \\
 \hline
 \quad \quad \quad 503d. \\
 \text{Ans. } 41s. 11d.
 \end{array}$$

$$\begin{array}{r}
 19. \quad 19\frac{1}{4} \text{ at } 9\frac{1}{8}d. \\
 \quad \quad \text{at } 9\frac{1}{8}d. = 9s. 1\frac{1}{2}d. \\
 \quad \quad 6 \quad \text{,,} = 4 \quad 6\frac{3}{4} \\
 \quad \quad 1 \quad \text{,,} = 0 \quad 9\frac{3}{8} \\
 \quad \quad \frac{1}{4} \quad \text{,,} = 0 \quad 2\frac{1}{4} \\
 \hline
 \text{Ans. } 14s. 7\frac{1}{2}d.
 \end{array}$$

$$\begin{array}{r}
 20. \quad 90\frac{7}{8}s. = \pounds 4 \quad 10s. 10\frac{1}{2}d. \\
 \hline
 6d. = \frac{1}{4} \quad \left| \begin{array}{l} 2 \quad 5 \quad 5\frac{1}{4} \\ 2d. = \frac{1}{3} \quad \left| \begin{array}{l} 0 \quad 15 \quad 1\frac{1}{4} \\ \frac{3}{4}d. = \frac{1}{3} \quad \left| \begin{array}{l} 0 \quad 5 \quad 8 \end{array} \right. \end{array} \right. \\
 \hline
 \text{Ans. } \pounds 3 \quad 6 \quad 3
 \end{array}$$

$$\begin{array}{r}
 21. \quad 31\frac{1}{2} \text{ at } 23\frac{5}{8}d. \\
 \hline
 240 \quad \pounds 23 \quad 12 \quad 6 \\
 30 = \frac{1}{8} \quad \left| \begin{array}{l} 2 \quad 19 \quad 0\frac{3}{4} \\ 1 \quad \left| \begin{array}{l} 0 \quad 1 \quad 11\frac{1}{2} \\ \frac{1}{8} \quad \left| \begin{array}{l} 0 \quad 0 \quad 11\frac{3}{4} \end{array} \right. \end{array} \right. \\
 \hline
 \text{Ans. } \pounds 3 \quad 2 \quad 0
 \end{array}$$

$$\begin{array}{r}
 22. \quad 47\frac{1}{2} \text{ at } 27\frac{1}{12}d. \\
 \quad \quad 27\frac{1}{12} \text{ at } 4s. = 108s. 4d. \\
 \quad \quad \quad \text{at } \frac{1}{2}d. = 1 \quad 1\frac{1}{2} \\
 \hline
 \quad \quad \quad 107s. 2\frac{1}{2}d. \\
 \text{Ans. } \pounds 5 \quad 7s. 2\frac{1}{2}d.
 \end{array}$$

$$\begin{array}{r}
 23. \quad 190\frac{7}{8}d. = \pounds 0 \quad 15s. 10\frac{7}{8}d. \\
 190\frac{7}{8}s. = 9 \quad 10 \quad 10\frac{7}{8} \\
 \text{Cost at } 2s. = 19 \quad 1 \quad 9 \\
 \quad \quad \text{at } \frac{1}{4}d. = 0 \quad 7 \quad 11\frac{1}{2} \\
 \hline
 \quad \quad \quad 12)18 \quad 13 \quad 9\frac{1}{2} \\
 \text{Ans. } \pounds 1 \quad 11s. 1\frac{1}{2}d.
 \end{array}$$

24. $8) £89\frac{1}{2} = £89 \text{ } 5s. \text{ } 0d.$
 $\quad \quad \quad \pm 11 \text{ } 3 \text{ } 1\frac{1}{2} = \text{cost at } 2s. \text{ } 6d.$
 $8) 89\frac{1}{2}d.$
 $\quad \quad \quad \frac{11}{78\frac{1}{2}d. = 0 \text{ } 6 \text{ } 6\frac{1}{2} = \text{cost at } 0 \text{ } 0\frac{1}{2}}$
 $\quad \quad \quad 12) £10 \text{ } 16 \text{ } 7\frac{1}{4}$
 $\quad \quad \quad \text{Ans. } £0 \text{ } 18 \text{ } 0\frac{1}{2}$

Exercises 6.

- | | |
|---|--|
| <p>1. $\begin{array}{r} 62057 \\ 248 \\ \hline 496456 \times 3 \\ 1489368 \\ \hline 15390136 \text{ Ans.} \end{array}$</p> | <p>2. $\begin{array}{r} 62057 \\ 549 \\ \hline 558513 \times 6 \\ 3351078 \\ \hline 34069293 \text{ Ans.} \end{array}$</p> |
| <p>3. $\begin{array}{r} 807439 \\ 426 \\ \hline 4844634 \times 7 \\ 33912438 \\ \hline 343969014 \text{ Ans.} \end{array}$</p> | <p>4. $\begin{array}{r} 807439 \\ 819 \\ \hline 7266951 \times 9 \\ 65402559 \\ \hline 661292541 \text{ Ans.} \end{array}$</p> |
| <p>5. $\begin{array}{r} 148703 \\ 726 \\ \hline 892218 \times 12 \\ 10706616 \\ \hline 107958378 \text{ Ans.} \end{array}$</p> | <p>6. $\begin{array}{r} 148703 \\ 497 \\ \hline 1040921 \times 7 \\ 7286447 \\ \hline 73905391 \text{ Ans.} \end{array}$</p> |
| <p>7. $\begin{array}{r} 27738 \\ 742 \\ \hline 194166 \times 6 \\ 1164996 \\ \hline 20581596 \text{ Ans.} \end{array}$</p> | <p>8. $\begin{array}{r} 27738 \\ 856 \\ \hline 221904 \times 7 \\ 1553328 \\ \hline 23743728 \text{ Ans.} \end{array}$</p> |
| <p>9. $\begin{array}{r} 2507386 \\ 654 \\ \hline 15044316 \times 9 \\ 135398844 \\ \hline 1639830444 \text{ Ans.} \end{array}$</p> | <p>10. $\begin{array}{r} 7363891 \\ 648 \\ \hline 58911128 \times 8 \\ 471289024 \\ \hline 4771801368 \text{ Ans.} \end{array}$</p> |

14 KEY TO SHORT METHODS IN ARITHMETIC.

$$\begin{array}{r}
 11. \quad 891257 \\
 \quad 3204 \\
 \hline
 \quad 3565028 \times 8 \\
 28520224 \\
 \hline
 2855587428 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 12. \quad 3926 \\
 \quad 8723 \\
 \hline
 \quad 31408 \times 9 \\
 282872 \\
 \hline
 \quad 11778 \\
 4)34246498 \dots \times 25 \\
 \hline
 856162450 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 13. \quad 7465 \\
 \quad 9819 \\
 \hline
 \quad 67185 \times 9 \\
 604665 \\
 67185 \\
 \hline
 73298835 \dots \times 99 \\
 73298835 \\
 \hline
 7256584665 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 14. \quad 8297 \times 365 \\
 \hline
 2)82970 \\
 \quad 41485 \times 7 \\
 290395 \\
 \hline
 3028405 \times 321 \\
 6056810 \\
 9085215 \\
 \hline
 972118005 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 15. \quad 511736 \\
 \quad 36120 \\
 \hline
 \quad 6140832 \times 3 \\
 18422496 \\
 \hline
 18483904320 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 16. \quad 993865 \\
 \quad 51236 \\
 \hline
 4969325 \\
 11926380 \times 3 \\
 35779140 \\
 \hline
 50921667140 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 17. \quad 83754 \\
 \quad 2643 \\
 \hline
 \quad 251262 \times 8 \\
 2010096 \\
 2010096 \\
 \hline
 221361822 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 18. \quad 9738 \\
 \quad 8379 \\
 \hline
 \quad 87642 \\
 262926 = 9 \text{ times } \times 3 \\
 788778 = 9 \text{ ,, } \times 9 \\
 4)81594702 \dots \times 25 \\
 \hline
 2039867550 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 19. \quad 9586 \\
 \quad 6954 \\
 \hline
 57516 \\
 86274 \times 6 \\
 517644 \\
 \hline
 66661044 \dots \times 99 \\
 66661044 \\
 \hline
 6599443356 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 20. \quad 8759 \\
 \quad 56749 \\
 \hline
 61313 \\
 429191 = 7 \text{ times } \times 7 \\
 490504 = 7 \text{ ,, } \times 8 \\
 \hline
 497064491 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 21. \quad 2786 \\
 \underline{12786} \\
 16716 \times 3 \\
 50148 \times 7 \\
 351036 \\
 8)35621796 \dots \times 125 \\
 \underline{4452724500} \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 22. \quad 187548 \\
 \underline{630728} \\
 1312836 \\
 5251344 = 7 \text{ times } \times 4 \\
 11815524 = 7 \text{ " } \times 9 \\
 \underline{118291774944} \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 23. \quad 42308 \\
 \underline{7854} \\
 253848 \times 3 \\
 761544 \times 3 \\
 2284632 \\
 \underline{332287032} \text{ contd.}
 \end{array}$$

$$\begin{array}{r}
 332287032 \\
 \underline{5296} \\
 1329148128 \times 3 \\
 3987444384 \times 8 \\
 31899555072 \\
 \underline{1759792121472} \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 24. \quad 54387 \\
 \underline{13296} \\
 652644 \\
 652644 \times 8 \\
 5221152 \\
 \underline{723129552} \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 25. \quad 9356 \\
 \underline{4962} \\
 18712 \times 8 \\
 149696 \times 3 \\
 449088 \\
 \underline{46424472} \text{ contd.}
 \end{array}$$

$$\begin{array}{r}
 25 \text{ continued.} \\
 2)46424472. \times 365 \\
 232122360 \times 7 \\
 1624856520 \\
 \underline{16944932280} \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 26. \quad 170625 \times 8 \\
 \underline{1365000} \\
 9587000 \\
 1365 \\
 \underline{124631000} \times 5 \\
 623155000 \\
 \underline{13086255000} \text{ Ans.}
 \end{array}$$

Exercises 7.

$$\begin{array}{r}
 1. \quad 156s. \ 6d. \div 2s. \ 1d. = 1878 + 25 \\
 \underline{4} \\
 75 \cdot 12 \text{ lb. Ans.}
 \end{array}$$

$$\begin{array}{r}
 2. \quad 126s. \div 10s. \ 5d. = 1512 \div 125 \\
 \underline{8} \\
 12 \cdot 096 \text{ gall. Ans.}
 \end{array}$$

16 KEY TO SHORT METHODS IN ARITHMETIC.

$$\begin{aligned}
 3. \quad & \frac{24}{25} \text{ of } 693\cdot4 = 693\cdot4 - \frac{1}{25} \text{ of } 693\cdot4 \\
 & \qquad \qquad \qquad \frac{4}{25} \\
 & = 693\cdot4 - \frac{27\cdot736}{25} \\
 & = 665\cdot664 \text{ cub. ft. } \textit{Ans.}
 \end{aligned}$$

$$\begin{array}{r}
 4. \quad \begin{array}{r} 256\frac{5}{8} \text{ qu.} \\ 8 \\ \hline 2053 \text{ bu.} + 75 \end{array} \qquad \begin{array}{r} 3)20\cdot53 \\ 6\cdot84\frac{1}{3} \\ \hline 27\cdot37\frac{1}{3} \textit{ Ans.} \end{array}
 \end{array}$$

$$\begin{array}{r}
 5. \quad \begin{array}{r} \text{(i.) } 3)25934 \\ \cdot08644\frac{2}{3} \\ \hline \cdot34578\frac{2}{3} \textit{ Ans.} \end{array} \qquad \begin{array}{r} \text{(ii.) } 85508\cdot28 \\ 855\cdot08 \\ 8\cdot55 \\ \hline \cdot09 \\ \hline 86372\cdot00 \textit{ Ans.} \end{array}
 \end{array}$$

$$\begin{array}{r}
 6. \quad \begin{array}{r} \text{(i.) } \begin{array}{r} 25908 \times \cdot002 \\ 3 \quad 51\cdot816 \\ 10 \quad 17\cdot272 \\ 10 \quad 1\cdot7272 \\ \quad \cdot1727 \\ \hline 10000 \quad 70\cdot9879 \\ \quad \cdot0071 \\ \hline \textit{Ans. } 70\cdot9808 \end{array} \end{array} \qquad \begin{array}{r} \text{(ii.) } \begin{array}{r} 1234567\cdot89 \\ 12345\cdot68 \\ 123\cdot46 \\ 1\cdot23 \\ \hline \cdot01 \\ \hline \textit{Ans. } 1247038\cdot27 \end{array} \end{array}
 \end{array}$$

$$\begin{array}{r}
 7. \quad \begin{array}{r} 2406\cdot67s. \times \cdot002 \\ 3 \quad 4\cdot81334 \\ 10 \quad 1\cdot60444 \\ 10 \quad \cdot16044 \\ \quad \cdot01604 \\ \hline 10000 \quad 6\cdot59426 \\ \quad \cdot00066 \\ \hline 6\cdot59360s. \\ \textit{Ans. } 6s. 7\cdot123d. \end{array} \qquad 8. \quad \begin{array}{r} 76880\cdot9 \times \cdot003 \\ 5 \quad 230\cdot6427 \\ 100 \quad 46\cdot1285 \\ 10 \quad \cdot4613 \\ -10 \quad \cdot0461 \\ \hline 277\cdot2786 \\ \quad \cdot0046 \\ \hline \textit{Ans. } 277\cdot274 \text{ gall.} \end{array}
 \end{array}$$

$$\begin{array}{r}
 9. \quad \begin{array}{r} \text{(i.) } 117\cdot918 \text{ oz.} \div 8\frac{1}{3} \text{ oz.} \\ = 353\cdot754 \quad + 25 \\ \quad \quad \quad 4 \\ \hline 14\cdot15016 \textit{ Ans.} \end{array} \qquad \begin{array}{r} \text{(ii.) } 117\cdot918 \text{ oz.} \div 62\frac{1}{2} \\ = 235\cdot836 \text{ oz.} + 125 \\ \quad \quad \quad 8 \\ \hline 1\cdot886688 \text{ oz. } \textit{Ans.} \end{array}
 \end{array}$$

KEY TO SHORT METHODS IN ARITHMETIC. 17

10. $14090.5s. \times .002$ 11. $01234 \div 9\frac{3}{8}$

3	28.1810
10	9.39366
10	.93937
	.09394
10000	38.60797
	.00386

$38\ 60411s. = 38s. 7.249d. Ans.$

	$= .09872 + 75$
3)	.0009872
	.0003291 -
	.0013163 - <i>Ans.</i>

12. $1234 \times .002$ 13. $7011s. \times .002$

3	2.468
10	.822666
10	.082267
	.008227
10000	3.38116
	.00034

$3.38082 + .75$
 $3)3.38082$
 1.12694
 $4.50776 Ans.$

3	14.022
10	4.674
10	.4674
	.0467
10000	19.2101
	.0019

$s. 19.2082$
 $d. 2.4984$
 or $19s. 2\frac{1}{2}d. Ans.$

14. $9999 \times .003$ 15. 64777.78

5	29.997
100	5.9998
10	.0600
-10	.0060
	36.0628
	.0006

$36.0612 Ans.$

	647.78
	6.48
	.06
	<u>65482.10</u> <i>Ans.</i>

16. $111111 f \div 365 f$ 17. 5000

	.002
3	222.222
10	74.074
10	7.4074
	.7407
10000	304.4441
	.0304

Ans. 304.4137

	.003
5	15.000
100	3.000
10	.030
-10	.003
	18.033
	.0003

Ans. 18.0327 gall.

18 KEY TO SHORT METHODS IN ARITHMETIC.

18. $2840s. \times .002$

$$\begin{array}{r} 3 \quad 5.68 \\ 10 \quad 1.89333 \\ 10 \quad .18933 \\ \quad .01893 \\ \hline 10000 \quad 7.7816 \\ \quad .0007 \\ \hline 7.781s. \end{array}$$

Ans. 7s. 9.372d.

19. $303910000 \times .002$

$$\begin{array}{r} 3 \quad 607820 \\ 10 \quad 202606.6\bar{3} \\ 10 \quad 20260.6\bar{3} \\ \quad 2026.0\bar{3} \\ \hline 10000 \quad 832713.4 \\ \quad 83.3 \\ \hline \end{array}$$

Ans. 832630

20. 26812.17
 268.122
 2.681
 $.027$
 $\hline 27083.000 \div 365$
 $.002$
 $\hline 54.166 \text{ cont.}$

$$\begin{array}{r} 3 \quad 54.166 \\ 10 \quad 18.0553 \\ 10 \quad 1.8055 \\ \quad .1806 \\ \hline 10000 \quad 74.2074 \\ \quad .0074 \\ \hline \end{array}$$

Ans. 74.2

21. 19.58
 14.07
 $\hline 13706$
 27412
 $\hline 275.4906$
 $5\frac{5}{8}$
 $8)1377.4530$
 172.1816
 $\hline 1549.6346$
 1728
 $\hline 123970768$
 1115736912
 15496346
 $\hline 2677768.5888$
or $2677768.6 \text{ cub. in. cont.}$

$$\begin{array}{r} 2677768.6 \times .003 \\ 5 \quad 8033.3058 \\ 100 \quad 1606.6609 \\ 10 \quad 16.0666 \\ -10 \quad 1.6067 \\ \hline 9657.6400 \\ \quad -.16 \\ \hline \end{array}$$

Ans. 9657.48 gall.

22. $2)3650$
 1825×7
 $\hline 12775$
 $\hline 133225$
 1332
 $\hline 13$
 \hline
Ans. 134570

Exercises 8.

1. $\begin{array}{r} 114.75 \\ .05 \times 83 = \underline{4.15} \\ 172125 \\ 45900 \\ \hline 476.2125 \times .002 \end{array}$

3		.9524
10		.3175
10		.0317
		.0032
10000		1.3048
		.0001
		<u>£1.3047</u>
		s. 6.094

26s. 1.13d. Ans.

2. $\begin{array}{r} 462.925 \times .04 \\ \hline 18.517 \\ 113 \\ \hline 55551 \\ 203687 \\ \hline 2092.421 \times .002 \end{array}$

3		4.1848
10		1.3949
10		.1395
		.0140
10000		5.7332
		.00057
		<u>£5.73263</u>
		s. 14.6526

£5 14s. 7.83d. Ans.

3. $\begin{array}{r} £129 \text{ } 11\frac{3}{4}\text{s.} \times .03 \\ \hline 3.8875 \times 206 \\ 38875 \\ 233250 \\ \hline 800.825 \times .002 \end{array}$

3		1.6016
10		.5339
10		.0534
		.0053
10000		2.1942
		.0002
		<u>£2.1940</u>
		s. 3.880

£2 3s. 10.56d. Ans.

4. $\begin{array}{r} 1691\text{s. } 9\text{d.} \\ £20301 \times .035 \\ 240 \\ 30 = \frac{1}{3} \\ 8 = \frac{1}{30} \end{array}$

		710.535
		88.817
		23.684
		<u>823.036 \times .002</u>
3		1.646072
10		.548691
10		.054869
		.005487
10000		2.255119
		.000225
		<u>£2.254894</u>
		s. 5.09788

£2 5s. 1.174d. Ans.

20 KEY TO SHORT METHODS IN ARITHMETIC.

5. 9836s. 9d.

$$\begin{array}{r} \pounds 118041 \times .025 \\ \hline \pounds 2951.025 \end{array}$$

$$\begin{array}{r} 240 \\ 80 = \frac{1}{3} \quad 983.67 \\ 80 = \frac{1}{3} \quad 983.67 \\ 60 = \frac{1}{4} \quad 737.76 \\ 3 = \frac{1}{20} \quad 36.89 \end{array}$$

$$\begin{array}{r} 2741.99 \times .002 \\ 3 \quad 5.48398 \\ 10 \quad 1.82800 \\ 10 \quad .18280 \\ \quad .01828 \\ 10000 \quad 7.51306 \\ \quad .00075 \end{array}$$

$$\begin{array}{r} \pounds 7.51231 \\ s. 10.2462 \\ \text{Ans. } \pounds 7 \text{ 10s. } 2.954d. \end{array}$$

6. 1.91 $\times \frac{21}{4}$

$$\begin{array}{r} 382 \\ 4 \overline{) 40.11} \\ 10.0275 \\ \quad 1108 \\ \quad \quad 802200 \\ \quad \quad 1103025 \end{array}$$

$$\begin{array}{r} s. d. \\ 10 \text{ 0} = \frac{1}{3} \quad 11110.47 \\ 2 \text{ 6} = \frac{1}{4} \quad 5.01375 \\ 1 \text{ 3} = \frac{1}{2} \quad 1.25344 \\ \quad .62672 \end{array}$$

$$\begin{array}{r} 11117.3639 \times .002 \\ 3 \quad 22.23473 \\ 10 \quad 7.41157 \\ 10 \quad .74116 \\ \quad .07411 \\ 10000 \quad 30.46157 \\ \quad .00304 \\ \pounds 30.45853 \\ s. 9.1706 \end{array}$$

$$\text{Ans. } \pounds 30 \text{ 9s. } 2.047d.$$

7. 26594s. 11d.
for 296 da. at $4\frac{1}{2}$ per cent.

$$\begin{array}{r} 3191.39 \times \frac{9}{2} \\ \hline 28722.51 \\ 240 \quad \pounds 14361.25 \\ 48 = \frac{1}{2} \quad 2872.25 \\ 8 = \frac{1}{3} \quad 478.71 \\ 17712.21 + 365 \end{array}$$

cont. 17712.21 $\times .002$

$$\begin{array}{r} 3 \quad 35.42442 \\ 10 \quad 11.80814 \\ 10 \quad 1.18081 \\ \quad .11808 \\ 10000 \quad 48.53145 \\ \quad .00485 \\ \pounds 48.5266 \\ s. 10.532 \end{array}$$

$$\text{Ans. } \pounds 48 \text{ 10s. } 6.384d.$$

8. 1897s. 4d.
for 143 days at $3\frac{1}{4}$ p.c.

$$\begin{array}{r} 22768 \times \frac{13}{4} \\ \hline 68304 \\ 4 \overline{) 295984} \\ 240 \quad \pounds 739.96 \\ 80 = \frac{1}{3} \quad 246.65 \\ 60 = \frac{1}{4} \quad 184.99 \\ 3 = \frac{1}{20} \quad 9.25 \\ 440.89 \end{array}$$

$$\begin{array}{r} 440.89 \times .002 \\ 3 \quad .88178 \\ 10 \quad .29393 \\ 10 \quad .02939 \\ \quad .00294 \\ 10000 \quad 1.20804 \\ \quad .00012 \\ \pounds 1.20792 \\ s. 4.1584 \\ \pounds 1 \text{ 4s. } 1.9d. \text{ Ans.} \end{array}$$

Exercises 9.

1. $186.25 \times .03$
- $$\begin{array}{r} 5.5875 \\ 191.8375 \\ 5.7551 \\ 197.5926 \\ 5.9278 \\ 203.5204 \\ 6.1056 \\ \hline \pounds 209.6260 \end{array}$$
- or $\pounds 209$ 12s. 6.24d. *Ans.*
2. 654.1625
- $$\begin{array}{r} 2\frac{1}{2} = \frac{1}{40} = 16.3541 \\ 1 = \frac{1}{100} = 6.5416 \\ \hline 677.0582 \\ 16.9264 \\ 6.7706 \\ \hline 700.7552 \\ 17.5189 \\ 7.0076 \\ \hline 725.2817 \\ 18.1320 \\ 7.2528 \\ \hline 750.6665 \end{array}$$
- or $\pounds 750$ 13s. 3.96d. *Ans.*
3. $1179.72916 \times .03\frac{1}{4}$
- $$\begin{array}{r} 35.39187 \\ \frac{1}{400} = 2.94932 \\ 1218.07035 \\ 36.54211 \\ 3.04518 \\ 1257.65764 \\ 37.72973 \\ 3.14414 \\ 1298.53151 \\ 1179.72916 \\ 118.80235 \\ \hline \end{array}$$
- or $\pounds 118$ 16s. 0.56d. *Ans.*
4. $2\frac{1}{2} = \frac{1}{40}$
- $$\begin{array}{r} 1.025 \\ \frac{1}{40} = .025625 \\ 1.050625 \\ .026266 \\ 1.076891 \\ .026922 \\ 1.103813 \\ .027595 \\ 1.131408 \\ 1.131408)400.0 \\ 353.5418 \\ \hline \end{array}$$
- or $\pounds 353$ 10s. 10.03d. *Ans.*
5. 1.0525
- $$\begin{array}{r} 5 = \frac{1}{20} = .052625 \\ \frac{1}{4} = \frac{1}{20} = .00263125 \\ 1.10775625 \\ .05538781 \\ .00276939 \\ 1.16591345 \\ 1.16591345)1178.204 \frac{1}{4} \\ 3.49774035)3534.6125 \\ 1010.5411 \\ \hline \end{array}$$
- or $\pounds 1010$ 10s. 10d. *Ans.*
6. 1.045
- $$\begin{array}{r} 2\frac{1}{2} = \frac{1}{40} = .026125 \\ 2 = \frac{1}{50} = .0209 \\ 1.092025 \\ .0273006 \\ .0218405 \\ 1.1411661 \\ .0285292 \\ .0228233 \\ 1.1925186 \\ .0298130 \\ .0238503 \\ 1.2461819 \\ .0311545 \\ .0249236 \\ 1.3022600 \\ \hline \end{array}$$
- int. on 1 = $.30226$
- 6 cont.
- $$\begin{array}{r} .30226)17.2791\frac{1}{4} \\ .90678)51.8375 \\ 57.16656 \\ \hline \end{array}$$
- or $\pounds 57$ 3s. 3.97d. *Ans.*

MISCELLANEOUS QUESTIONS.

1. Strike out 2 from 4218; the G.C.M. of 2109 and 4389 is found in the usual way to be 57. *Ans.*

2. $27\frac{1}{2}s.$ per cwt. = £27 17s. 6d. per ton;
 20 tons at $557\frac{1}{2}s.$ = £557 10s. 0d.
 1 ton = 27 17 6
 19 tons = £529 12 6 *Ans.*

3. Cost of $\frac{24}{20}$ of a ton = $1\frac{1}{5}$ of £6 11s. $8\frac{1}{2}d.$
 $\frac{1}{5} = 1 \quad 6 \quad 4$
 $\frac{1}{20}$ of a ton = $\frac{1}{5} \times \frac{1}{4} = 7 \quad 18 \quad 0\frac{1}{2}$
 $\frac{24}{20}$ „ = £7 11s. $5\frac{1}{2}d.$ *Ans.*

4. (i.) $\begin{array}{r} 4)239.. \\ \underline{5975} \end{array}$ (ii.) $\begin{array}{r} 1426054 \times .01\frac{1}{2} \\ \underline{475351\frac{1}{2}} \end{array}$
Ans. 17925 *Ans.* 19014.05 $\frac{1}{2}$

5. (i.) $\begin{array}{r} 6834 \\ 5397 \\ \hline 47838 \times 7 \\ 334866 \\ 334866 \\ \hline 36883098 \end{array}$ (ii.) $\begin{array}{r} 1368.. \\ 1368 \\ \hline 135432 \end{array}$ *Ans.*
Ans. 36883098 *Ans.*

6. (i.) 460 at 34s. 9d. (ii.) 365 at 55s. $4\frac{1}{2}d.$
 $\begin{array}{r|l} 240 & £417 \\ 80 = \frac{1}{3} & 139 \\ 80 = \frac{1}{3} & 139 \\ 60 = \frac{1}{2} & 104 \quad 5 \\ \hline \end{array}$ *Ans.* £799 5s.
 $\begin{array}{r|l} 240 & £664 \quad 10s. \quad 0d. \\ 80 = \frac{1}{3} & 221 \quad 10 \quad 0 \\ 30 = \frac{1}{6} & 83 \quad 1 \quad 3 \\ 15 = \frac{1}{12} & 41 \quad 10 \quad 7\frac{1}{2} \\ \hline \end{array}$ *Ans.* £1010 11 10 $\frac{1}{2}$

7. (i.) $\begin{array}{r} 6.321 \\ .01236 \\ \hline 75852 \\ 227556 \\ \hline .07812756 \end{array}$ *Ans.*
 (ii.) $\begin{array}{r} 8)4567... \\ \hline 570875 \end{array}$ *Ans.*
8. $\begin{array}{r|l} 5)39780 & 370188 \quad 46 \\ 7956 & 31824 \\ \hline & 51948 \\ & 47736 \\ \hline 4212 & 7956 \quad 1 \\ 3744 & 4212 \quad 1 \\ \hline \text{Ans. } 468 & 3744 \quad 8 \end{array}$

9. (i.) 289 at 16s. 10½d.

$$\begin{array}{r|l} 240 & £202 \ 10 \ 0 \\ 48 = \frac{1}{2} & 40 \ 10 \ 0 \\ 1 & 0 \ 16 \ 10\frac{1}{2} \\ \hline & Ans. £243 \ 16 \ 10\frac{1}{2} \end{array}$$

(ii.) 12½ at £9 13s. 3d.

$$\begin{array}{r|l} & 12 \\ & 115 \ 19 \ 0 \\ \frac{4}{18} = \frac{1}{4} = & 2 \ 8 \ 3\frac{1}{4} \\ \frac{1}{18} = \frac{1}{4} = & 0 \ 12 \ 1 \\ \hline & Ans. £118 \ 19 \ 4\frac{1}{4} \end{array}$$

10. (i.) 4789

$$\begin{array}{r} 73284 \\ 57468 \\ 402276 = 12 \text{ times } \times 7 \\ 344808 = \text{ditto } \times 6 \\ \hline 350957076 \text{ Ans.} \end{array}$$

(ii.) 578..
 $\frac{1}{4} = 14450$
 43350 Ans.

11.

$$\begin{array}{r|l} £225 \ 13s. & \\ 4513s. \times .002 & \\ 3 & 9.026 \\ 10 & 3.0086 \\ 10 & .3009 \\ & .0301 \\ 10000 & 12.3656 \\ & .0012 \\ & 12.3644s. \\ & 12s. 4.37d. Ans. \end{array}$$

12. 365 at 9s. 11½d.

$$\begin{array}{r|l} 240 & £119 \ 10 \ 0 \\ 80 = \frac{1}{3} & 39 \ 16 \ 8 \\ 30 = \frac{1}{3} & 14 \ 18 \ 9 \\ 15 = \frac{1}{3} & 7 \ 9 \ 4\frac{1}{2} \\ \hline & £181 \ 14 \ 9\frac{1}{2} \end{array}$$

13.	5)13505	15987	5
	2701	13505	
	2)2482	2701	2
	1241	2482	
	3)219	1241	17
	73	73	
		511	

14. (i.) 9999..

$$\begin{array}{r} 9999 \\ 4)989901.. \\ \hline Ans. 24747525 \end{array}$$

(ii.) 674...

$$\begin{array}{r} 674 \\ 4)673326.. \\ \hline 16833150 \\ Ans. 50499450 \end{array}$$

15. (i.) 310 at 8s. 5½d.

$$\begin{array}{r|l} 240 & £101 \ 5 \ 0 \\ 60 = \frac{1}{2} & 25 \ 6 \ 3 \\ 10 = \frac{1}{2} & 4 \ 4 \ 4\frac{1}{2} \\ \hline & Ans. £130 \ 15 \ 7\frac{1}{2} \end{array}$$

(ii.) 477 at 6s. 1½d.

$$\begin{array}{r|l} 240 & £ \ 73 \ 15 \ 0 \\ 240 & 73 \ 15 \ 0 \\ \hline & 147 \ 10 \ 0 \\ -3 & 0 \ 18 \ 5\frac{1}{2} \\ \hline & Ans. £146 \ 11 \ 6\frac{1}{4} \end{array}$$

24 KEY TO SHORT METHODS IN ARITHMETIC.

$$\begin{array}{r}
 16. \quad 3794 \\
 \quad 8526 \\
 \quad 22764 \times 2 \\
 \quad 45528 \times 7 \\
 \quad 318696 \\
 \quad 32347644 \times .008 \\
 \hline
 258781.152 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 17. \quad 366 \text{ at } 4s. 5\frac{1}{2}d. \\
 240 \quad \begin{array}{|l} \hline £53 \ 10 \ 0 \\ \hline \end{array} \\
 120 = \frac{1}{2} \quad \begin{array}{|l} \hline 26 \ 15 \ 0 \\ \hline \end{array} \\
 6 = \frac{1}{20} \quad \begin{array}{|l} \hline 1 \ 6 \ 9 \\ \hline \end{array} \\
 \hline
 \text{Ans. } £81 \ 11 \ 9
 \end{array}$$

$$\begin{array}{r}
 18. \quad 109.26 \\
 \quad 109.26 \\
 \quad 65556 \times 2 \\
 \quad 131112 \times 9 \\
 \quad 1180008 \\
 \quad 11937.7476 \div 365 \\
 \hline
 \text{cont.}
 \end{array}$$

$$\begin{array}{r}
 11937.75 \times .002 \\
 3 \quad \begin{array}{|l} \hline 23.87550 \\ \hline \end{array} \\
 10 \quad \begin{array}{|l} \hline 7.95850 \\ \hline \end{array} \\
 10 \quad \begin{array}{|l} \hline .79585 \\ \hline \end{array} \\
 \quad \begin{array}{|l} \hline .07958 \\ \hline \end{array} \\
 10000 \quad \begin{array}{|l} \hline 32.70943 \\ \hline \end{array} \\
 \quad \begin{array}{|l} \hline .00327 \\ \hline \end{array} \\
 \hline
 \text{Ans. } 32.70616
 \end{array}$$

$$\begin{array}{r}
 19. \quad 277.274 \\
 \quad 27365 \\
 \quad 3604562 \\
 \quad 18022810 = 13 \text{ times } \times 5 \\
 \quad 7209124 = \text{ditto } \times 2 \\
 \hline
 7587603.010 \text{ c. in. Ans.}
 \end{array}$$

$$\begin{array}{r}
 20. \text{ (i.) } 47 \text{ yds. at } 20\frac{3}{4}d. \\
 20\frac{3}{4} \text{ yds. at } (4s. - 1d.) \\
 4 \\
 83s. = £4 \quad 3s. 0d. \\
 20\frac{3}{4}d. = 0 \quad 1 \quad 8\frac{3}{4} \\
 \hline
 \text{Ans. } £4 \quad 1s. 3\frac{1}{4}d.
 \end{array}$$

$$\begin{array}{r}
 \text{ (ii.) } 53 \text{ at } 19\frac{1}{2}d. \\
 240 \quad \begin{array}{|l} \hline £19 \quad 2s. \ 6d. \\ \hline \end{array} \\
 40 = \frac{1}{5} \quad \begin{array}{|l} \hline 3 \ 3 \ 9 \\ \hline \end{array} \\
 12 = \frac{1}{20} \quad \begin{array}{|l} \hline 0 \ 19 \ 1\frac{1}{2} \\ \hline \end{array} \\
 1 \quad \begin{array}{|l} \hline 0 \ 1 \ 7\frac{1}{2} \\ \hline \end{array} \\
 \hline
 \text{Ans. } £4 \quad 4s. 5\frac{1}{2}d.
 \end{array}$$

$$\begin{array}{r}
 21. \text{ (i.) } 2869 \\
 \quad 2968 \\
 \quad 22952 \times 12 \\
 \quad 275424 \\
 \quad 5738 \\
 \quad 8515192 \\
 \quad 7926 \\
 \quad 51091152 \times 12 \\
 \quad 613093824 \\
 \quad 619093824 \\
 \hline
 67491411792 \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 22. \quad 23791 \times .002 \\
 3 \quad \begin{array}{|l} \hline 47.582 \\ \hline \end{array} \\
 10 \quad \begin{array}{|l} \hline 15.8607 \\ \hline \end{array} \\
 10 \quad \begin{array}{|l} \hline 1.5860 \\ \hline \end{array} \\
 \quad \begin{array}{|l} \hline .1586 \\ \hline \end{array} \\
 10000 \quad \begin{array}{|l} \hline 65.1873 \\ \hline \end{array} \\
 \quad \begin{array}{|l} \hline .0065 \\ \hline \end{array} \\
 \quad 65.1808 \times .01\frac{1}{2} \\
 \quad 21.7269 \\
 \hline
 \text{Ans. } .869077
 \end{array}$$

21 cont. (ii.) $77.92 \times 1\frac{1}{3}$
 $\begin{array}{r} 25.97\frac{1}{3} \\ \hline \text{Ans. } 103.89\frac{1}{3} \end{array}$

23. $\begin{array}{r|l} 4)27028 & 3)21669 \\ \hline 6757 & 7223 \\ 2)466 & 699 \\ \hline 233 & 233 \end{array}$ 31

24. One no. = $\sqrt{9801} = 99$;
 the other = $294426 \div 99$:
 $\begin{array}{r} 2944.26 \\ 29.443 \\ 294 \\ .003 \\ \hline \text{Ans. } 2974.000 \end{array}$

25. 87 at $13s. 2\frac{1}{4}d.$
 $\begin{array}{r|l} 240 & £158 \text{ } 5s. \text{ } 0d. \\ \hline 60 = \frac{1}{4} & 39 \text{ } 11 \text{ } 3 \\ 24 = \frac{1}{10} & 15 \text{ } 16 \text{ } 6 \\ 3 = \frac{1}{20} & 1 \text{ } 19 \text{ } 6\frac{3}{4} \\ \hline \text{Ans. } £57 \text{ } 7s. \text{ } 3\frac{3}{4}d. \end{array}$

26. $\begin{array}{r} 23706\frac{1}{8} \\ 6 \\ \hline 142237 \times .002 \\ \hline \begin{array}{r} 3 \quad 284.474 \\ 10 \quad 94.825 \\ 10 \quad 9.482 \\ \quad .948 \\ \hline 10000 \quad 389.729 \\ \quad .039 \\ \hline 389.69 \end{array} \end{array}$ Ans.

27. $43.54\frac{5}{8}s.$
 $\begin{array}{r} 6\frac{5}{8} \\ 8)261.29 \\ \hline 32.66\frac{1}{8} \\ 293.95\frac{1}{8} \\ \hline 230 \\ \hline 881850 \\ 58790287 \\ \hline 67608.787s. + 365 \\ \text{continued.} \end{array}$

27 cont. $67608.79s. \times .002$
 $\begin{array}{r} 3 \quad 135.2176 \\ 10 \quad 45.0725 \\ 10 \quad 4.5072 \\ \quad .4507 \\ \hline 10000 \quad 185.2180 \\ \quad .0185 \\ \hline 185.2295s. \\ 12 \\ \hline 2.7540d. \\ \text{Ans } £9 \text{ } 5s. \text{ } 2\frac{3}{4}d. \end{array}$

28. (i.) 93 at $66s. 9\frac{3}{4}d.$
 $\begin{array}{r|l} 240 & £801 \text{ } 15s. \text{ } 0d. \\ \hline 60 = \frac{1}{4} & 200 \text{ } 8 \text{ } 9 \\ 30 = \frac{1}{2} & 100 \text{ } 4 \text{ } 4\frac{1}{2} \\ 3 = \frac{1}{10} & 10 \text{ } 0 \text{ } 5\frac{1}{4} \\ \hline \text{Ans. } £310 \text{ } 13 \text{ } 6\frac{3}{4} \end{array}$

(ii.) 511 at $37s. 8d.$
 $\begin{array}{r|l} 240 & £452 \\ 240 & 452 \\ 30 = \frac{1}{2} & 56 \text{ } 10 \text{ } 0 \\ 1 & 1 \text{ } 17 \text{ } 8 \\ \hline \text{Ans. } £962 \text{ } 7s. \text{ } 8d. \end{array}$

29. $\begin{array}{r} 9)123456789 \\ \hline 13717421 \times 625 \times 4 \\ 4)1371742100 \times 25 \\ \hline 34293552500 \end{array}$ Ans.

26 KEY TO SHORT METHODS IN ARITHMETIC.

30. (i.)
$$\begin{array}{r} 123741 \\ 147321 \\ \hline 866187 \\ 371223 \times 7 \\ 2598561 \\ \hline 1732374 = 7 \text{ times } \times 2 \\ 18229647861 \text{ Ans.} \end{array}$$

(ii.)
$$\begin{array}{r} 4)11925 \\ \hline \text{Ans. } 2981\frac{1}{4} \end{array}$$

31.
$$\frac{428}{308} \text{ or } \frac{107}{99} \text{ or } 1\frac{8}{99} \text{ of } £15 \text{ } 16s. \text{ } 9\frac{1}{2}d.$$

$$\begin{array}{r} £15 \text{ } 16s. \text{ } 9\frac{1}{2}d. \\ 1 \text{ } 5 \text{ } 7 \\ \hline \text{Ans. } £17 \text{ } 2s. \text{ } 4\frac{1}{2}d. \end{array}$$

$$\begin{array}{r} 11)126 \text{ } 14 \text{ } 4 \\ 9)11 \text{ } 10 \text{ } 4\frac{1}{2} \\ \hline £1 \text{ } 5s. \text{ } 7d. \end{array}$$

32.
$$\begin{array}{r|l} 9729 & 13113 \\ 8)3384 & 9729 \\ \text{G.C.M. } 423 & 846 \\ & \hline & 1269 \end{array} \quad \begin{array}{l} 1 \\ 23 \end{array}$$

$$\begin{array}{r} 2)113646 \\ 423 \overline{)56823} \quad 134 \\ \hline 423 \\ \hline 1452 \\ 1269 \\ \hline 1833 \\ 1692 \\ \hline \text{Ans. } 141 \quad 3 \end{array}$$

33.
$$\frac{5 \times 59}{100} = \frac{60-1}{20} = 3 - \frac{1}{20};$$

$$\begin{array}{r} 20)£1385 \text{ } 15s. \text{ } 11\frac{1}{2}d. \\ \hline 3 \\ 4157 \text{ } 7 \text{ } 9 \\ 69 \text{ } 5 \text{ } 9\frac{1}{2} \\ \hline £4088 \text{ } 1 \text{ } 11\frac{1}{2} \\ \text{divided by } 365, \\ = £4088 \div 365; \end{array}$$

$$\begin{array}{r} £4088 \times .002 \\ 3 \overline{)8.176} \\ 10 \overline{)2.7253} \\ 10 \overline{).2725} \\ \hline .0273 \\ 10000 \overline{)11.2011} \\ \hline .0011 \\ \text{Ans. } £11.2000 \end{array}$$

34.
$$\begin{array}{r} 364.775 \times .04 \\ 14.59100 \\ \hline 379.36600 \\ 15.17464 \\ \hline 394.54064 \end{array}$$

$$\begin{array}{r} 394.54064 \times .04 \\ 15.78162 \\ \hline 410.32226 \\ 364.775 \\ \hline £ 45.54726 \text{ Ans.} \end{array}$$

35.

$ \begin{array}{r} 7\cdot32 \\ 7\cdot32 \\ \hline 8784 \times 6 \\ 52704 \\ \hline 53\cdot5824 \\ 7\cdot32 \\ \hline 6429888 \times 6 \\ 38579328 \\ \hline 392\cdot223168 \end{array} $	$ \begin{array}{r} 392\cdot223 \\ \cdot5236 \\ \hline 1568892 \times 3 \\ 4706676 \times 3 \\ \hline 14120028 \\ \hline 205\cdot3679628 \\ \hline \text{or } 205\cdot368 \text{ c. ft. } Ans. \end{array} $
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36. (i.) $215 \text{ at } £\frac{1}{8} = £26 \text{ } 17s. \text{ } 6d.$ (ii.) $\frac{3}{8} \text{ at } £117 \text{ } 12s. \text{ } 6d.$
 at $\frac{1}{8}d. = 26\frac{1}{8}d. = 0 \text{ } 2 \text{ } 3$
Ans. $£26 \text{ } 15s. \text{ } 3d.$

$$\begin{array}{r}
 3 \\
 8 \overline{) 352 \text{ } 17 \text{ } 6} \\
 \hline
 \text{Ans. } £ \text{ } 44 \text{ } 2s. \text{ } 2\frac{1}{4}d.
 \end{array}$$

37

$ \begin{array}{r} 277\cdot274 \text{ c. in.} \\ 3165 \\ \hline 831822 \times 5 \\ 4159110 \\ 4159110 \\ \hline 877572\cdot210 \\ 11 \times 7 \times 1728 \end{array} $	$ \begin{array}{r} 11 \overline{) 877572\cdot210} \\ 7 \overline{) 79779\cdot2918} \\ 12 \overline{) 11397\cdot0417} \\ 12 \overline{) 949\cdot7535} \\ \hline 79\cdot146 \text{ in.} \\ \hline \text{or } 6 \text{ ft. } 7\cdot146 \text{ in. } Ans. \end{array} $
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38

$ \begin{array}{r} 544 \text{ times } 1483s. \text{ } 10\frac{1}{2}d. \\ 240 \overline{) £17806\cdot5} \\ 240 \overline{) 17806\cdot5} \\ 40 = \frac{1}{8} \overline{) 2967\cdot75} \\ 24 = \frac{1}{10} \overline{) 1780\cdot65} \\ \hline 40361\cdot4 \times \cdot03 \\ 1210\cdot842 + 365 \end{array} $	$ \begin{array}{r} 1210\cdot84 \times \cdot002 \\ 3 \overline{) 2\cdot4217} \\ 10 \overline{) \cdot8072} \\ 10 \overline{) \cdot0807} \\ 10000 \overline{) \cdot0081} \\ \hline 10000 \overline{) 3\cdot3177} \\ \hline \cdot0003 \\ \hline \text{Ans. } £3\cdot3174 \end{array} $
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39.

$ \begin{array}{r} \frac{117\frac{1}{2}}{99} \text{ of } £391 \\ = \frac{1}{99} \text{ of } 391 \text{ times } 2350s. \\ 240 \overline{) £28200} \\ 120 = \frac{1}{2} \overline{) 14100} \\ 30 = \frac{1}{4} \overline{) 3525} \\ 1 \overline{) 117\cdot5} \\ \hline \frac{1}{99} \text{ of } £45912\cdot5 = £464 \text{ } 1s. \text{ } 3\frac{3}{4}d. \text{ } Ans. \end{array} $	$ \begin{array}{r} 459\cdot425 \\ 4\cdot59425 \\ \cdot04594 \\ \cdot00046 \\ \hline 464\cdot06565 \\ \hline \text{or } £464\cdot065 \end{array} $
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28 KEY TO SHORT METHODS IN ARITHMETIC.

40. (i.) 504 at 7s. 8½d.

240	£92 10s.
240	92 10
24 = $\frac{1}{10}$	9 5
<i>Ans.</i>	£194 5s

(ii.) 154 at 13s. 6½d.

240	£162 15s.	0d.
120 = $\frac{1}{2}$	81 7	6
24 = $\frac{1}{10}$	16 5	6
10 = $\frac{1}{13}$	6 15	7½
<i>Ans.</i>	£104 8s.	7½d.

41. 3)92463 4)156604

30821	39151	1
10)8330	30821	37
G.C.M. 833	2499	
	5831	

5)131495	
833	26299 31
	2499
	1309
4)476	833 7
<i>Ans.</i> 119	833

42. (i.) 11½ at 15s. 2¼d.

11
£8 7 0½
½ = 0 3 9½
<i>Ans.</i> £8 10s. 10½d.

(ii.) 76 at 1s. 10¾d.

240	£22 7s.	6d.
60 = ¼	5 11	10½
15 = ¼	1 7	11½
1	0 1	10¾
<i>Ans.</i>	£7 1s.	8½d.

43. £1236·9

$\frac{1}{20} =$	61·845
	1298·745
	64·93725
	1363·68225
	68·18411
	1431·86636
	71·59332
	£1503·45968
	9·1936s.
<i>Ans.</i>	£1503 9s. 2·32d.

44. $\frac{217}{385}$ of 163 oz. of tea

	217
	1141
	3423
	35371 × ·002
3	70·742
10	23·5806
10	2·3581
	·2358
10000	96·9165
	·0097
<i>Ans.</i>	96·9068

45. 10 | 1·0

8	·1
11	·0125
14	·001136
17	·000081
	·000005
<i>Ans.</i>	·113722

46. 2)5630

	2815 × 7
	19705
	2054·95
	20·55
	·20
	2075·70

47. $8317s. 3d.$

343 times	$\pounds 998.07$	$\times 2\frac{1}{4}$
	998.07	
	249.5175	
240	2245.6575	
$40 = \frac{1}{5}$	374.2762	
$60 = \frac{1}{4}$	561.4144	
$3 = \frac{1}{20}$	28.0707	
	<u>3209.4188</u>	

	3209.42 $\times .002$
3	6.41884
10	2.13961
10	.21396
	<u>.02140</u>
10000	8.79381
	<u>.00088</u>
	8.79293

Ans. $\pounds 8\ 15s. 10\ 3d.$

48. (i.) $7\frac{5}{8}$ at $\pounds 1\ 10s. 5d.$

3	0	10	= 2 times
8)	7	12	1 = 5 times
	0	19	0 = $\frac{1}{8}$ of 5 times

Ans. $\pounds 11\ 11s. 11d.$

(ii.) $9\frac{5}{12}$ at $12s. 5\frac{1}{2}d.$

2	9	10	= 4 times
12)	3	2	$3\frac{1}{2}$ = 5 times
	0	5	$2\frac{1}{4}$ = $\frac{1}{12}$ of 5 times

Ans. $\pounds 5\ 17s. 3\frac{1}{4}d.$

49. $89102 \times .003$

5	267.306
100	53.461
10	.535
-10	<u>.053</u>
	321.355
	<u>.005</u>

Ans. 321.35 gall.

50. Wt. of 1 gall. = $\frac{277274}{12 \times 12 \times 12}$ oz.

=	160.45949 oz.
=	10.028718 lb.
=	$.0044771$ ton
	<u>5617</u>
	313397×8
	<u>44771</u>
	2507176

Ans. 25.1478707 tons

51. $\pounds 159.2292$

$5 = \frac{1}{20}$	7.9614
$1 = \frac{1}{100}$	1.5923
	<u>168.7829</u>
	8.4391
	<u>1.6878</u>
	178.9098
	8.9455
	<u>1.7891</u>

Ans. $\pounds 189.6444$
or $\pounds 189\ 12s. 10.6d.$

52. $\frac{336}{325}$ of 11.27 ac.

	336
	<u>3381</u> $\times 12$
	40572
	<u>3786.72</u> $\times .002$
3	7.57344
10	2.52446
10	.25245
	<u>.02524</u>
10000	10.37559
	<u>.00104</u>

Ans. 10.37455 ac.

30 KEY TO SHORT METHODS IN ARITHMETIC.

53.
$$\begin{array}{r|l} 3)3198 & \\ \hline 1066 & 2002 \\ 9)936 & 1066 \\ 104 & 1040 \\ \hline \text{g.c.m. } 26 & 104 \end{array} \quad \begin{array}{l} 1 \\ 10 \\ 4 \end{array}$$

$$\begin{array}{r} 2)26 \\ \hline \text{Ans. } 13)4745 \\ \hline 365 \end{array}$$

54.
$$\begin{array}{l} \frac{125}{121} \text{ of } 1 \frac{123}{99999} \text{ of } 4768 \frac{406}{999} \\ = \frac{125}{121} \text{ of } \frac{814}{813} \text{ of } \frac{4768 \times (1000-1) + 406}{999} \\ = \frac{125}{11} \text{ of } \frac{74}{813} \text{ of } \frac{4768000 - 4362}{999} \\ = \frac{125}{11} \text{ of } \frac{2}{813} \text{ of } \frac{4763638}{27} = \frac{1000}{4 \times 813} \text{ of } \frac{433058}{27} \\ = \frac{1000}{12} \text{ of } \frac{1598}{27} = \frac{1598000}{4 \times 9 \times 9} = 4932 \frac{8}{81} \text{ Ans.} \end{array}$$

55.
$$\begin{array}{r} 1 \text{ ton} = 2240 \text{ lb.} \\ \hline 16 \\ \hline 35840 \text{ oz.} \\ \text{an oz.} = 1.728 \text{ c. in.} \\ \hline 35840 \\ 250880 \times 4 \\ \hline 1003520 \\ 1 \text{ ton} = 61931.520 \text{ c. in.} \end{array} \quad \begin{array}{r} 61931.52 \times .003 \\ \hline 5 \mid 185.794 \\ 100 \mid 37.159 \\ 10 \mid .372 \\ -10 \mid .037 \\ \hline 223.362 \\ \hline .004 \\ \hline \text{Ans. } 223.358 \text{ gall.} \end{array}$$

56.
$$\begin{array}{r} 2)564930 \\ 282465 \times 7 \\ \hline 1977255 \\ 20619945 \\ \hline 3986 \frac{4}{11} \\ \text{Ans. } 20615958 \frac{7}{11} \end{array} \quad \begin{array}{r} 3946.50 \\ 39.465 \\ .3946 \\ .0040 \\ \hline 3986.36 \end{array}$$

57. (i.)
$$\begin{array}{r} 63\frac{1}{4} \text{ at } 19\frac{1}{2}d. \text{ a doz.} \\ \hline 12)£19 \text{ } 5s. \text{ } 0d. \\ \hline 240 \mid \begin{array}{l} £1 \text{ } 12 \text{ } 1 \\ 60 = \frac{1}{4} \mid 0 \text{ } 8 \text{ } 0.25 \\ 3 = \frac{3}{10} \mid 0 \text{ } 0 \text{ } 4.80 \\ \frac{1}{4} = \frac{1}{12} \mid 0 \text{ } 0 \text{ } 0.40 \\ \hline £0 \text{ } 8s. \text{ } 5.46d. \\ \text{Ans. } 8s. \text{ } 5\frac{1}{2}d. \end{array} \end{array}$$

(ii.)
$$\begin{array}{l} 17\frac{7}{8} \text{ at } 35\frac{3}{4}d. \text{ a doz.} \\ 1\frac{1}{2} \text{ doz.} - \frac{1}{96} \text{ of a doz.} \\ \text{will cost } 1\frac{1}{2} \text{ of } 2s. \text{ } 11\frac{3}{4}d. \\ - \frac{1}{96} \text{ of } 143 \text{ farthings} \\ \hline 2s. \text{ } 11\frac{3}{4}d. \\ \frac{1}{3} = 1 \mid 5\frac{3}{4} \\ 4s. \text{ } 5\frac{3}{4}d. \\ \hline - \frac{1}{2}d. \\ \hline \text{Ans. } 4s. \text{ } 5\frac{1}{4}d. \end{array}$$

58.
$$\begin{array}{r} 20)7\cdot4166s. \\ \underline{\pounds93\cdot370833} \\ 2\frac{1}{2} = \frac{1}{40} = 2\cdot334271 \\ 1 = \frac{1}{100} = \cdot933708 \\ \underline{96\cdot638812} \\ 2\cdot415970 \\ \underline{\cdot966388} \\ 100\cdot021170 \end{array}$$

$$\begin{array}{r} 100\cdot02117 \\ \frac{1}{40} = 2\cdot50053 \\ \frac{1}{100} = 1\cdot00021 \\ \underline{103\cdot52191} \\ 2\cdot58805 \\ \underline{1\cdot03522} \\ 107\cdot14518 \end{array}$$

Ans. $\pounds107\ 2s.\ 10\cdot84d.$

59. $15 + 31 + 27 + 366 = 439$ days;
 $\frac{439}{365}$ of $\frac{\pounds251\cdot25}{30} = \pounds8\cdot375 \times (1\frac{1}{5} + \frac{1}{365})$;

$$\begin{array}{r} \cdot002 \\ 3 \left| \cdot01675 \\ 10 \left| \cdot00558 \\ 10 \left| \cdot00056 \\ \underline{\cdot00006} \end{array}$$

$$\begin{array}{r} \pounds8\cdot375 \times \frac{1}{365} = \cdot02295 \\ \text{ditto} \times 1\cdot2 = 10\cdot05 \end{array}$$

Ans. $\pounds10\cdot07295 = \pounds10\ 1s.\ 5\frac{1}{2}d.$

60.
$$\begin{array}{r} 479 \\ 896 \\ \underline{3832} \times 12 \\ 45984 \\ \text{Ans. } 4\cdot29184 \text{ ac.} \\ 4 \\ \underline{1\cdot16736} \text{ ro.} \\ 40 \\ \underline{6\cdot69440} \text{ po.} \\ \text{or } 4 \text{ ac. } 1 \text{ ro. } 6\cdot7 \text{ po.} \end{array}$$

61.
$$\begin{array}{r} 381\cdot52 \\ 75 \text{ of } 7\cdot385 \\ = \frac{381\cdot52}{15} \text{ of } 1\cdot477 \\ = 1\cdot477 \times 25\cdot434\frac{2}{3} \\ \begin{array}{r} 1\cdot477 \\ \cdot492\frac{1}{3} \\ \cdot492\frac{1}{3} \\ \underline{178\cdot038} \\ 1780\cdot38 \\ \underline{35607\cdot6} \end{array} \end{array}$$

Ans. $37\cdot567$

62. $\frac{324}{325}$ of $\pounds48\cdot3 = \pounds48\cdot3 - \frac{1}{325}$ of $\pounds48\cdot3$;

$$\begin{array}{r} 48\cdot3 \times \cdot002 \\ 3 \left| \cdot0966 \\ 10 \left| \cdot0322 \\ 10 \left| \cdot00322 \\ \underline{\cdot00032} \\ \cdot13234 \end{array}$$

$$\begin{array}{r} \pounds48\cdot3 \\ \underline{\cdot13234} \\ \text{Ans. } \pounds48\cdot16766 \\ \text{or } \pounds48\ 3s.\ 4\cdot24d. \end{array}$$

32 KEY TO SHORT METHODS IN ARITHMETIC.

63. $\frac{276}{36\frac{1}{2}}$ of £9 14s. 2½d.
 $= \frac{276}{365}$ of 10 times 194s. 2½d.

240	£23302·5
24 = $\frac{1}{10}$	2330 25
12 = $\frac{1}{2}$	1165·125
	£26797·875

to be divided by 365;

	26·797875 × 2
3	53·595750
10	17·865250
10	1·786525
	·178652
10000	73·426177
	·007343
	£73·418834

Ans. £73 8s. 4·52d.

64. (i.) 77½ at £6 17s. 9d.

	7
48	4 3
	11½
530	6 9
6	0 6½

Ans. £536 7s. 3½d.

(ii.) 58½ at 4s. 4½d.

	= 233 at 1 1½
12	£11 13s. 0d.
8)	0 19 5
	0 2 5

Ans. £12 14s. 10d.

65. 11·1666s.

£1056·55833	× ·03
31·69675	
260 = $\frac{1}{400}$	2·64140
	1090·89648
	32·72689
	2·72724
	1126·35061

1126·35061 × ·03

	33·79052
$\frac{1}{400}$ =	2·81588
	1162·95701
	1056·55833
	£ 106·39868

Ans. £106 7s. 11·68d.

66. (i.) 12)214·5

	17·875 doz.
	40
	715·000d.
$\frac{6}{12} = \frac{1}{2}$	8·937
$\frac{1}{12} = \frac{1}{8}$	1·490
	12)725·427d.

Ans. 60s. 5·43d.

(ii.) 12)147

	12½ doz. at 5½d.
	= 5½ doz. at 1s. 0½d.
	= 5½s. + ½ of 5½d.
	= 5s. 4½d.
	+ 0 1½
	Ans. 5s. 5½d.

$$\begin{array}{r}
 67. \quad \frac{4653}{12 \times 12 \times 12} \text{ of } 277 \cdot 274 \text{ c. ft.} \\
 \quad \quad \quad \frac{517}{1940918} \\
 \quad \quad \quad \frac{277274}{1386370} \\
 12) 143350 \cdot 658 \\
 16) 11945 \cdot 888 \\
 \quad \underline{3746 \cdot 618} \\
 \quad = 9 \cdot 07 \text{ ft. } Ans.
 \end{array}$$

$$\begin{array}{r}
 68. \quad \frac{193}{225} \text{ of } 616s. 5\frac{1}{4}d. \\
 = \frac{193}{75} \text{ of } 205s. 5\frac{3}{4}d. \\
 \hline
 240 \quad \pounds 2465 \cdot 75 \\
 120 = \frac{1}{2} \quad 1232 \cdot 875 \\
 60 = \frac{1}{4} \quad 616 \cdot 437 \\
 12 = \frac{1}{6} \quad 123 \cdot 287 \\
 1 = \frac{1}{12} \quad 10 \cdot 274 \\
 \hline
 75) 1982 \cdot 873 \\
 \quad 19 \cdot 829 \\
 \quad \quad 6 \cdot 609 \\
 \hline
 Ans. \pounds 26 \text{ } 8s. \text{ } 9d. = \pounds 26 \cdot 438
 \end{array}$$

$$\begin{array}{r}
 69. \quad '105^2 - 1 \cdot 1) \text{ of the} \\
 \quad \text{principal} = \pounds 13 \cdot 5; \\
 \quad 1 \cdot 1025 - 1 \cdot 1 = \cdot 0025; \\
 \quad \text{hence, } \pounds 13 \cdot 5 \div \cdot 0025 \\
 \quad = \pounds 135000 \div 25; \\
 \quad \quad \cdot 04 \\
 \quad \pounds 5400 \cdot 00 \\
 \hline
 Ans. \pounds 5400
 \end{array}$$

$$\begin{array}{r}
 70. \quad 163853 \times 9800 \div 99 \\
 \hline
 1638530000 \\
 - \quad 32770600 \\
 \hline
 16057594 \cdot 00 \\
 160575 \cdot 94 \\
 1605 \cdot 76 \\
 16 \cdot 05 \\
 16 \\
 \hline
 Ans. 16219791 \cdot 91
 \end{array}$$

$$\begin{array}{r}
 71. \quad (i.) \quad 26\frac{2}{3}s. = \pounds 1 \text{ } 6s. \text{ } 4\frac{1}{2}d. \\
 \quad \frac{1}{12} \text{ of } 26\frac{2}{3}d. = 0 \text{ } 0 \text{ } 2\frac{1}{4} \\
 \hline
 \quad \quad \quad Ans. \pounds 1 \text{ } 6s. \text{ } 2\frac{1}{4}d.
 \end{array}$$

$$\begin{array}{r}
 (ii.) \quad 17\frac{3}{4} \text{ at } 71\frac{3}{4}d \\
 \hline
 12 \quad \text{,,} = \pounds 3 \text{ } 11s. \text{ } 9d. \\
 6 \quad \text{,,} = 1 \text{ } 15 \text{ } 10\frac{1}{2} \\
 \quad \quad \quad 5 \text{ } 7 \text{ } 7\frac{1}{2} \\
 -\frac{1}{4} \quad \text{,,} \quad \quad 0 \text{ } 1 \text{ } 6 \\
 \hline
 \quad \quad \quad Ans. \pounds 5 \text{ } 6s. \text{ } 1\frac{1}{2}d.
 \end{array}$$

$$\begin{array}{r}
 72. \quad 331^2 \times 7854 \times 191 \\
 \quad \quad \quad 70686 \\
 \quad \quad \quad \quad 7854 \\
 \quad \quad \quad \hline
 \quad \quad \quad 150 \cdot 0114 \\
 \quad \quad \quad 4500342 \\
 \quad \quad \quad 4500342 \\
 \quad \quad \quad \hline
 \quad \quad \quad 49653 \cdot 7734 \\
 \quad \quad \quad 1489613202 \\
 \quad \quad \quad 1489613202 \\
 \hline
 \quad \quad \quad 16435398 \cdot 9954 \text{ c. in.}
 \end{array}$$

$$\begin{array}{r}
 16435399 \times \cdot 003 \\
 \hline
 5 \quad 49306 \cdot 197 \\
 100 \quad 9861 \cdot 239 \\
 10 \quad 98 \cdot 612 \\
 -10 \quad 9 \cdot 861 \\
 \hline
 \quad 59275 \cdot 909 \\
 \quad \quad \cdot 986 \\
 \hline
 Ans. 59274 \cdot 923 \text{ gall.}
 \end{array}$$

34 KEY TO SHORT METHODS IN ARITHMETIC.

73. Buys 68 copies for $\frac{75}{100}$ of $\frac{13s.}{2} \times 63 = \frac{1}{2}$ of $(39s. \times 63)$;
 sells 68 for $\frac{1}{2}$ of $2457s. + 32\frac{7}{8}s. = 340s.$,
 which is 5s. a copy, or 1s. 6d. discount on 6s. 6d.,
 $= \frac{1\frac{1}{2}}{6\frac{1}{2}}$ or $\frac{3}{13}$ of 100 on 100 = $23\frac{1}{13}$ per cent. *Ans.*

74.

3	20
5	·666667
7	·133333
9	·019047
11	·002116
13	·000192
15	·000015
	·000001

Ans. 2·821371
75. $\frac{23\cdot456}{99}$ of 70 = $\frac{1641\cdot92}{99}$
 16·4192
 ·1642
 ·0016
Ans. 16·5850

76. Edge of cube = $\mathcal{V}(5\cdot12 \times 3\cdot75 \times 2\cdot43)$
 $= \frac{1}{100}$ of $\mathcal{V}(512 \times 125 \times 729) = \frac{1}{100}$ of $8 \times 5 \times 9$
 $= 360 + 100 = 3\cdot6$ in. *1st Ans.*
 Original surface = $5\cdot12 \times 2(3\cdot75 + 2\cdot43) + 2(3\cdot75 \times 2\cdot43)$
 $= 5\cdot12 \times 12\cdot36 + 2\cdot43 \times 7\cdot5$

14832	24300
6180	6075

 $63\cdot2832 + 18\cdot225 = 81\cdot5082$ sq. in.
 Surface of cube $3\cdot6^2 \times 6 = 77\cdot76$
 Surface of cube less by $3\cdot7482$ sq. in. *2nd Ans.*

77.

? calico = 365 flannel	$\frac{1595 \times 1025 \times 365}{109 \times 12 \times 7 \times 61}$
1308 flannel = 1025 linen	$= \text{Ans.}$
427 linen = 1595 calico	

1595	2)16348750
1025	8174375 × 7
39875	57220625
1595	12)596729375
1634875	7)49727448
	6649)7103921

Ans. 1068·42—yds.

78. The weight, viz. 112 lb. \times 1125, will be equal to
 $62\frac{1}{2}$ lb. \times 32 \times $18\frac{3}{4}$ \times the depth in feet;
 \therefore depth = $\frac{1125 \times 112 \times 6}{32 \times 56 \times 125} = \frac{9 \times 2 \times 6}{32} = 3\frac{3}{8}$ ft. *Ans.*

79. No. of days from beginning of July to end of December
 $= 31 + 31 + 30 + 31 + 30 + 31 = 184$;

$$\frac{5}{9900} \text{ of } 24 \text{ hrs.} \times 184 = (184 \times 1.2) \div 99$$

$$73.6 \text{ hrs.} \div 33 = 73 \text{ hrs. } 36 \text{ min.} \div 33$$

$$= 24 \text{ hrs. } 32 \text{ min.} \div 11 = 2 \text{ hrs. } 13\frac{9}{11} \text{ min. Ans.}$$

80. The actual consumption $= \frac{100}{117\frac{1}{2}}$ of 11280 c. ft.; therefore
 the amount that ought to be charged is

$$3s. 9d. \times \frac{49}{27} \text{ of } 11.28 = 3s. 9d. \times 4 \times 2.4$$

$$= 15s. \times 2.4 = 36s. \text{ Ans.}$$

81. ? c. in. copper = 963 iron
 1460 iron = 986 lead
 3257 lead = 4214 copper
- | | |
|---|---|
| $\begin{array}{r} 986 \times 963 \times 4214 \\ 1460 \times 3257 \\ \hline = \text{Ans.} \end{array}$ | $\begin{array}{r} 986 \times 963 \times 4214 \\ 1460 \times 3257 \\ \hline = \text{Ans.} \end{array}$ |
|---|---|
- $$= (493 \times 963 \times 2107) \div (365 \times 3257)$$
- | | |
|--|--|
| $\begin{array}{r} 493 \\ 963 \\ \hline 4437 \\ 31059 \\ \hline 474759 \times 2107 \\ 474759 \\ 474759 \\ 3323313 \\ \hline 1000317213 \end{array}$ | $\begin{array}{r} 3257 \overline{) 1000317213} \\ 3071284 \times .002 \\ 3 \\ 10 \\ 10 \\ 10000 \\ \hline 841.5317 \\ .0841 \\ \hline \text{Ans. } 841.4476 \end{array}$ |
|--|--|

82. Square of the required side $= \frac{1171.24}{693}$ of 40°
 $= (16732 \times 16) \div 99$
 $= 267712 \div 99$
- | | |
|--|--|
| $\begin{array}{r} 2677.12 \\ 26.7712 \\ .2677 \\ .0027 \\ \hline \sqrt{2704.16} = 52 \text{ in. Ans.} \end{array}$ | $\begin{array}{r} 2677.12 \\ 26.7712 \\ .2677 \\ .0027 \\ \hline \sqrt{2704.16} = 52 \text{ in. Ans.} \end{array}$ |
|--|--|

83. Width $= \sqrt{(\frac{1}{2} \text{ of } 60\frac{1}{2})} = 5\frac{1}{2}$ yds.; \therefore length $= 11$ yds.
 Circuit of walls $= (11 + 5\frac{1}{2}) \times 2 = 33$ yds.
 $3s. 5\frac{1}{2}d. \times 33 \times 5\frac{1}{2} = £2 \text{ } 15s. 4d. \times 11 = £30 \text{ } 8s. 8d. \text{ Ans.}$

84. $(\frac{7}{122\frac{1}{2}} - \frac{5\frac{1}{2}}{105})$ of the capital $= £34\frac{11}{10}$
 that is, $(\frac{2}{3} - \frac{1}{30})$ of the capital $= \frac{1}{10}$ of £1381;
 or $(\frac{19}{30} - \frac{1}{30})$ of it $= £1381$;
 hence $£1381 \div \frac{2}{3} = £4833 \text{ } 10s. \text{ Ans.}$

36 KEY TO SHORT METHODS IN ARITHMETIC.

85. $\frac{97\frac{1}{2}}{100}$ of the invoice price is to be $\frac{112\frac{1}{2}}{100}$ of $17\frac{1}{2}s.$;
 \therefore invoice price = $\frac{112\frac{1}{2}}{97\frac{1}{2}}$ of $\frac{52s.}{3} = 20s.$ *Ans*

86. $100 \times \left(\frac{99\frac{1}{2}}{100} \text{ of } \frac{103}{100} \right)^3 - 100 = (1.02485^3 - 1) \times 100$

512425	1.0503175
819880	1.02485
2459640	52515875
102485	84025400
1.0503175225	252076200
	10503175

Ans. 7.6418 per cent. = $(1.076418 - 1) \times 100$

87. The altitude is equal to half the base ; $\therefore 99^2$ is equal to twice the square of the altitude ; hence the square root of $\frac{1}{2}(9900 - 99) = \sqrt{4900.5} = 70$ almost exactly. *Ans.*

88.

10201	162150
$\times 9$	15
<u>9</u>	137
83	1234
<u>747</u>	11111

The G.C.M. of $\overline{6724}$ and $\overline{99999}$ is 41 ;

the denary form of the fraction, therefore, in lowest terms is $\frac{164}{2439}$; and we transform the terms to the unary form as follows :—

9)164	9)2439
9)18 . . . 2	9)271 . . . 0
<u>2</u> . . . 0	9)30 . . . 1
	<u>3</u> . . . 3

Hence $\frac{202}{3316}$ nonary. *Ans.*

89. $\frac{45}{2(25 + 29 + 36)} = 45$
 $\sqrt{(20 \times 16 \times 9 \times 45)} = 10 \times 4 \times 9$
 $= 360$, the area. *1st Ans.*

Now, the base AC multiplied by BD is equal to twice the area = 720 ; $\therefore 720 \div 36 = 20$. *2nd Ans.*

90. The product of the other nos. = $\frac{782775}{256} + \frac{71}{4} = \frac{11025}{64}$; and

if the smaller no. be called m , the larger = $\frac{1}{m}$ of $\frac{11025}{64}$.

Now $\frac{1}{m}$ of $\frac{11025}{64}$ is not $> \frac{49}{16}$ of m ;

hence $\frac{11025}{64}$ is not $> \frac{49}{16}$ of m^2 ;

$\therefore \frac{105}{8} \times \frac{4}{7}$, or $7\frac{1}{2}$, is not $> m$.

Again: $\frac{1}{m}$ of $\frac{11025}{64}$ is not $< \frac{9}{4}$ of m ;

hence $\frac{11025}{64}$ is not $< \frac{9}{4}$ of m^2 ;

$\therefore \frac{105}{8} \times \frac{2}{3}$, or $8\frac{3}{4}$, is not $< m$.

Wherefore, since $7\frac{1}{2}$ is not $> m$, and $8\frac{3}{4}$ is not $< m$, the limits for the least number are $7\frac{1}{2}$ and $8\frac{3}{4}$. *Ans.*

91. The present value of the prime cost at the moment of sale is $\frac{100}{101\frac{1}{4}}$ or $\frac{80}{81}$ of $13s. 6d. = 13s. 4d.$;

$\frac{109\frac{1}{11}}{100}$ of $13\frac{1}{2}s. = \frac{12}{11}$ of $13\frac{1}{2}s. = 14\frac{8}{11}s.$ the present value of the selling price at the same moment; hence the amount of 100 for the time sought—

$$= \frac{14\frac{8}{11}}{14\frac{8}{11}} \text{ of } 100 = \frac{44 \times 11}{160 \times 3} \text{ of } 100 = 100\frac{5}{8};$$

and $\frac{5}{8}$ is the interest on 100 for 2 months. *Ans.*

92. Volume of earth before removal = $\frac{100}{106\frac{1}{4}}$ or $\frac{16}{17}$ of 5136 cubic feet; therefore the depth

$$= \frac{16}{17} \text{ of } \frac{5136}{53\frac{1}{2} \times 12\frac{1}{2}} = \frac{16}{17} \text{ of } \frac{96 \times 2}{25} = \frac{16}{17} \text{ of } 7.68 \text{ ft.};$$

$$17)7.68$$

$$\underline{.45}$$

$$7.23 \text{ ft. } \textit{Ans.}$$

93. Cost of the mixture per gallon = $531\frac{1}{4}s. + 25 = 21\frac{1}{4}s.$
 \therefore the quantity at the higher price was to the other quantity as $21\frac{1}{4} - 19 : 25\frac{1}{4} - 21\frac{1}{4}$, or as $2\frac{1}{4}$ to 4; and 25 gallons divided in that proportion gives 9 gallons of the better quality *Ans.*

38 KEY TO SHORT METHODS IN ARITHMETIC.

94. Sum of the diameters = $34 \cdot 15 \times 2 = 68 \cdot 3$ inches and their ratio = $1 : \sqrt{3}$, or $1000 : 1732$; hence $\frac{1992}{1732}$ of $68 \cdot 3 = 68300 \div 2732 = 25$ in. the less diameter, and $68 \cdot 3 - 25 = 43 \cdot 3$ in. the greater.

Ans.

95. To get the square root of $2523\frac{4323}{888}$, let us first seek the G.C.M. of the terms of the fraction: this is found to be 165 *septenary*, as worked out in the annexed operation; and canceling it from the given fraction gives $\frac{22}{34}$. The remainder of work gives the following successive results:—

4323	6666	1
2343	4323	1
10)1650	2343	12
G.C.M. 165	165	
	363	

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96. The required area = $\frac{132^2}{365^2}$ of 27132

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$$199 \text{ „ „ in mixture;}$$

that is, very nearly 2 units in 14;

$$\therefore \frac{1}{7} \text{ of } 100 = 14\frac{2}{7} \text{ per cent. } \text{Ans.}$$

98. Let d denote the depth in inches:

$$60 \times 42 \times \frac{1}{2000} \text{ of } d = \frac{1}{4} \text{ of } 277 \cdot 274$$

$$\text{or } 60 \times 42 \times d = 277 \cdot 274 \times 500 = 500 \text{ gall. ;}$$

$$d = \frac{277 \cdot 274 \times 500}{60 \times 42} = \frac{277 \cdot 274 \times 25}{126}$$

$$= \frac{6931 \cdot 85}{126} = 55 \cdot 015 \text{ in. or 4 ft. } 7 \cdot 015 \text{ in. } \text{Ans.}$$

99. If A does a units of work in an hour, and B does b such units, B could do a units in $\frac{a}{b}$ of an hour, and A could do b units in $\frac{b}{a}$ of an hour;

$$\therefore \frac{b}{a} = \cdot 9604 \text{ of } \frac{a}{b}, \text{ or } \left(\frac{b}{a}\right)^2 = \cdot 9604,$$

$$\text{and } \therefore \frac{b}{a} = \sqrt{\cdot 9604} = \cdot 98;$$

hence $a : b :: 1 : \cdot 98$ or as 50 : 49;

but $a + b = \frac{1}{77}$ of the whole work; therefore,

A does $\frac{50}{99}$ of $\frac{1}{77} = \frac{50}{99 \times 77}$ or $\frac{100}{15246}$ per hour,

B does $\frac{49}{99}$ of $\frac{1}{77} = \frac{49}{99 \times 77}$ or $\frac{7}{1089}$ per hour;

so that A could do the whole in $15246 \div 100 = 152\cdot 46$ hours, and B the whole in $1089 \div 7 = 155\frac{4}{7}$ hours. *Ans.*

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